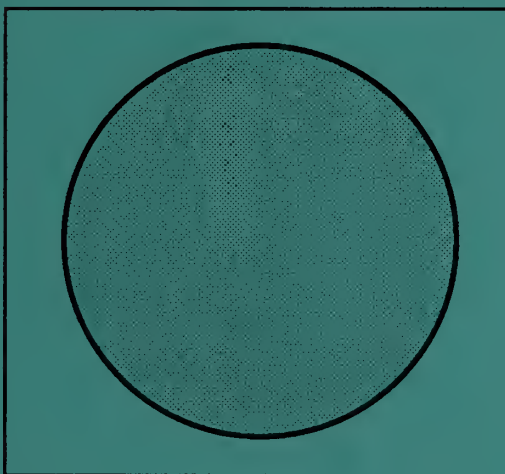
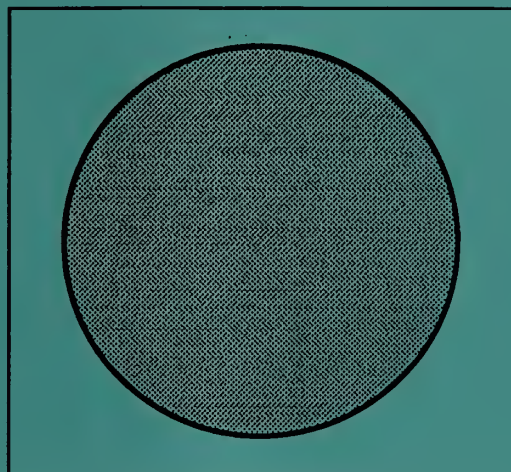




## Draft Environmental Impact Report

# Bay Trail Plan



January, 1989



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# **Draft Environmental Impact Report**

# **Bay Trail Plan**

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**January, 1989**

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# 1. Summary

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The draft Bay Trail Plan establishes policies and a proposed alignment for a roughly 550-mile long bicycle and pedestrian trail system around the perimeter of San Francisco and San Pablo Bay. Prepared by the Association of Bay Area Governments (ABAG) under the legislative authority of SB100, the plan provides a recommended route for a continuous trail and policies to guide alignment selection, trail design and implementation. This Environmental Impact Report (EIR) addresses the existing setting for the proposed alignment of Bay Trail within the regional perspective of the nine-county San Francisco Bay Area. Moreover, it analyzes the potential impacts and identifies mitigation measures to minimize the Plan's environmental effects. While both the alignment and the affiliated policies are assessed, the EIR examines the environmental effects of the proposed trail route in greater detail.

Three alternative project scenarios are evaluated:

No Project Alternative would rely on the independent, uncoordinated actions of shoreline jurisdictions and agencies to provide additional recreational opportunities along the bay shoreline;

Use of Existing Roads Alternative would place the Bay Trail entirely on roadways in the region; and

Shoreline Only Alternative would align the Bay Trail entirely along the bay shoreline, requiring additional bay fill to implement the trail.

As a program EIR, this document analyzes classes of impacts within the region-wide context of the Bay Trail Plan. The Plan sets out a regional program which will be implemented through the individual actions of numerous implementing agencies and jurisdictions. Mitigation measures are intended as a framework of actions that could be applied by implementing agencies as segments of the trail are developed. Site-specific environmental review will be necessary as individual trail segments are developed. Many of the draft Bay Trail policies are designed specifically to mitigate the possible effects of the trail's development.

The following tables summarize potential impacts associated with the draft Bay Trail policies (Table 1-1) and the proposed Bay Trail alignment (Table 1-2). Both tables identify draft Bay Trail policies which serve as environmental safeguards.

## Draft Bay Trail Plan Policies Summary of Impacts and Mitigations

### Draft Bay Trail Policy

### Impacts by Categories

### Recommended Mitigation<sup>1</sup>

#### Trail Design Policies, cont'd

- 16 A consistent signing program should be established throughout the trail system, using a Bay Trail logo which will identify trails within the Bay Trail system as distinct from other connecting trails. The choice of materials used should be the concern of the individual implementing jurisdictions and agencies.
- 17 Design and route the trail to discourage use of undesignated trails.
- 18 Domestic pets should be prohibited on new trails. This prohibition is not intended to apply to service animals such as guide dogs.
- 19 The trailhead signing program should include information describing the relative difficulty of the trail as a guide for trail users with mobility limitations.

None--Clear signing will help to keep undesignated trails, which would impact privacy and cause erosion, from forming.

None--Protects wildlife and habitat values.

None--Protects wildlife and habitat values; reduces hazards for bicyclists.

**Land Use:** May cause a minor increase in the intensity of use in certain trail segments.

- None required.

#### Environmental Protection Policies

- 20 The Advisory Committee is aware of the ecological value of wetlands. In the San Francisco Bay Area, these areas serve as a vital link in the Pacific flyway for feeding, breeding, nesting and cover for migratory birds. To avoid impacts in wetland habitats, the Bay Trail should not require fill in wetlands, and should be designed so that use of the trail avoids adverse impacts on wetland habitats.
- 21 The Bay Trail should not be defined as a continuous asphalt loop at the Bay's edge, but as a system of interconnecting trails, the nature of which will vary according to the locale and the nature of the terrain and resources in the vicinity of each particular trail segment.
- 22 The path will not always follow the bay shoreline; inland reaches may be more appropriate, especially for bicycle travel, in some parts of the bay region.

None--Protects wetland habitats from diverse impacts.

**Traffic and Circulation:** May create safety hazards and traffic conflicts.

**Land Use:** May create compatibility issues: privacy, noise, and crime concerns.

- Analyzed in Table 1-2, Traffic and Circulation.

- Analyzed in Table 1-2, Land Use.

## Draft Bay Trail Plan Policies Summary of Impacts and Mitigations

| <u>Draft Bay Trail Policy</u>                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <u>Impacts by Categories</u>                                                                                                                                                                                                                                                      | <u>Recommended Mitigation</u> <sup>1</sup>                                                                                                                           |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Environmental Protection Policies, cont'd</u> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                      |
| 23                                               | The path should be designed to accommodate different modes of travel (such as bicycling and hiking) and differing intensities of use, possibly requiring different trail alignments for each mode of travel, in order to avoid overly intensive use of sensitive areas.                                                                                                                                                                                                                                                                                                                     | <b>Land Use:</b> Multiple trails would increase construction-related impacts and require more acreage than one single route.                                                                                                                                                      | <ul style="list-style-type: none"> <li>Trail would be largely located on existing rights-of-way and levees.</li> </ul>                                               |
| 24                                               | Where the alignment of the Bay Trail may more appropriately be located away from the shoreline, access to shoreline areas may be possible by connecting the Bay Trail to existing loop trails and other interpretive facilities. These access points should be planned and designed to make clear the distinction between the continuous Bay Trail and the interpretive trail. (These may include different trail surfaces, marked entry points to interpretive areas, expanded facilities for education and shoreline interpretation, signage, regulation and enforcement of regulations.) | None--Serves to protect sensitive environments.                                                                                                                                                                                                                                   |                                                                                                                                                                      |
| 25                                               | Provision of land or funds for Bay Trail planning or construction shall not be considered mitigation for wetland losses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | None.                                                                                                                                                                                                                                                                             |                                                                                                                                                                      |
| <u>Transportation Access Policies</u>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                   |                                                                                                                                                                      |
| 26                                               | Bridges will be important connections in the Bay Trail system, providing not only commute routes, but enhancing the recreational use of the trail by creating trail loops which will allow a greater number of people to enjoy the trail.                                                                                                                                                                                                                                                                                                                                                   | <p><b>Traffic and Circulation:</b> May increase demand for access across bridges which do not currently have bicycle and pedestrian access.</p> <p><b>Socioeconomics:</b> Would potentially have an economic impact on budgetary allocations for transportation improvements.</p> | <ul style="list-style-type: none"> <li>Develop access program for each bridge reflecting constraints and opportunities.</li> <li>Apply Policy 27, 28, 29.</li> </ul> |
| 27                                               | In the short term, attention should be focused on improving safe access to the bridges, possible expansion of bicycle shuttle services and public transit accommodations of bicycles to allow cross-bay access.                                                                                                                                                                                                                                                                                                                                                                             | <b>Socioeconomics:</b> Would potentially have an economic impact on budgetary allocations for transportation systems and services.                                                                                                                                                | <ul style="list-style-type: none"> <li>Develop short-term solutions to providing bridge access.</li> </ul>                                                           |

## Draft Bay Trail Plan Policies Summary of Impacts and Mitigations

### Draft Bay Trail Policy

### Impacts by Categories

### Recommended Mitigation<sup>1</sup>

#### Transportation Access Policies, cont'd

28 In the long term, unconstrained access on bridge structures is preferred. This can more easily be accomplished in planning future facilities, as long as public access is a requirement for new structures. Legislative action which would require bicycle and pedestrian access on new facilities should be actively sought.

**Socioeconomic:** May increase demand to fund design solutions to provide access across new bridges.

- None required.

**Socioeconomic:** May increase pressure for legislative action; may divert funds from other trail projects

- None required.

29 Opportunities for cooperative funding of pedestrian and bicycle accessways should be investigated in order to make financing feasible.

**Socioeconomic:** May increase pressure for legislative action; may divert funds from other trail projects.

- Encourages funding options for trail construction.

#### Trail Implementation Policies

30a Establish "Friends of the Bay Trail." Investigate alternatives and develop details of operation and structure prior to July 1, 1989, to enable the organization to be operational as soon as feasible after adoption of the final Bay Trail Plan.

None.

30b Continue trail oversight, using the framework provided by the Regional Planning Committee.

None.

31 Explore the establishment of a management authority to coordinate maintenance, patrolling and liability functions for the portions of the Bay Trail.

None.

TABLE 1-1

## BAY TRAIL DESIGN GUIDELINES

| Item                                         | High-use<br>Facilities<br>(separate paths)*                                | Multi-Use<br>Paths * | Bicycle-only<br>Paths * | Hiking-only<br>Paths | Natural<br>Trails                  |
|----------------------------------------------|----------------------------------------------------------------------------|----------------------|-------------------------|----------------------|------------------------------------|
| Min. width (one-way)                         | 8-10'                                                                      | 10'                  | 8'                      | 5'                   | 3-5' <sup>a</sup>                  |
| Min. width (two way)                         | 10-12'                                                                     | 10-12'               | 10-12'                  | 8-10'                | 5'                                 |
| Surface                                      | asphalt <sup>b</sup>                                                       | asphalt              | asphalt                 | hardened             | natural or boardwalks <sup>c</sup> |
| Horiz. clearance<br>(incl. shoulders, below) | 12-16'                                                                     | 14-16'               | 10'                     | 9-12'                | 7-9'                               |
| Shoulder                                     | 2' area on both sides of the trail.....                                    |                      |                         |                      | tbd <sup>e</sup>                   |
| Vert. clearance                              | 10' .....                                                                  |                      |                         |                      | tbd                                |
| Cross slope                                  | 2% Max.....                                                                |                      |                         |                      | tbd                                |
| Max. grades                                  | 5% <sup>d</sup> for short distances with flat rest areas at turn outs..... |                      |                         |                      | tbd                                |

\* Standards meet CalTrans Bikeway Standards

<sup>a</sup> Min. widths that are less than 5' will be required to have 5x5 turnouts at intervals to meet accessibility standards.

<sup>b</sup> High-use pedestrian path could be hardened surface other than asphalt

<sup>c</sup> Natural surfaces may require surface hardening to provide accessibility.

<sup>d</sup> Except where site conditions require a greater slope for short distances.

<sup>e</sup> To be determined in site-specific review.

Table 1-2

## Proposed Bay Trail Alignment Summary of Impacts and Mitigations

| Impact Category <sup>1</sup> | Impacts <sup>2</sup>                                                                                                                                                                                                                                                                                                                 | Recommended Mitigations                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Land Use                     | <ol style="list-style-type: none"> <li>There would be potential conflict between trail use and wildlife activity.</li> </ol>                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>See Vegetation and Wildlife.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                     |
|                              | <ol style="list-style-type: none"> <li>Trail congestion in shoreline parks could burden restroom and parking facilities and interfere with other recreational uses of the parks.</li> </ol>                                                                                                                                          | <ul style="list-style-type: none"> <li>Potential facilities' related impacts at particular parks should be addressed at the project level and assessment made for sites where parking lot and restroom capacity may need to be expanded.</li> </ul>                                                                                                                                                                                                                                |
|                              | <ol style="list-style-type: none"> <li>Existing hunting activity in the wetlands of the San Francisco Bay Wildlife Refuge during the winter months may create a potential safety risk for trail users.</li> </ol>                                                                                                                    | <ul style="list-style-type: none"> <li>Negotiate agreements for joint use of private parking lots near the trail for use as staging areas.</li> <li>The trail should be routed along existing in-board levees.</li> <li>The zone of permitted hunting should also be reviewed to ensure a sufficient buffer between trail users and hunters and to prevent conflicts between these wetland user groups.</li> <li>Consider closing certain trails during hunting season.</li> </ul> |
|                              | <ol style="list-style-type: none"> <li>Impacts in residential areas include potential loss of homeowner privacy, increased neighborhood noise and the concerns for increased crime, including vandalism and burglary. (Potential noise and crime effects would be insignificant, based on studies of other urban trails.)</li> </ol> | <ul style="list-style-type: none"> <li>To minimize privacy and noise impacts on adjoining residential areas, new class I trail segments should be constructed with an adequate buffer strip. Screen plantings and fencing are also recommended whenever there are existing or planned residences immediately adjacent to the trail. Where feasible, 50' would be a desirable minimum easement width for new class I segments of the trail.</li> </ul>                              |
|                              | <ol style="list-style-type: none"> <li>New class I trails may introduce access near commercial/industrial areas which could impair security, particularly where buildings are oriented away from the trail and surveillance of trail activities is limited.</li> </ol>                                                               | <ul style="list-style-type: none"> <li>Buffer zones should be established where needed in class I sections of the trail. Property owners/businesses may increase security through installation of fencing or thorny barrier plants, restricting property access and/or orienting access away from the trail, and arranging clear visibility of activities on the trail and of site and building access points.</li> </ul>                                                          |
|                              | <ol style="list-style-type: none"> <li>Presence of explosive and/or toxic materials in industrial or institutional facilities may pose a safety hazard and inhibit the trail's development in their immediate vicinity.</li> </ol>                                                                                                   | <ul style="list-style-type: none"> <li>Buffer zones and fencing should be established where warranted. These measures can be supplemented by warning signage and lighting.</li> </ul>                                                                                                                                                                                                                                                                                              |
|                              | <ol style="list-style-type: none"> <li>The operation of heavy equipment and truck activity in industrial areas could endanger the safety of bicyclists and pedestrians.</li> </ol>                                                                                                                                                   | <ul style="list-style-type: none"> <li>Specifics of potential conflicts should be reviewed by a traffic engineer for appropriate mitigation. Mitigation measures could include warning signage, reduction of truck speed, installation of rumble strips on blind curves, restriction of truck traffic to local destinations, road widening to accommodate a class II facility, creation of class I trails or realignment of the trail.</li> </ul>                                  |

<sup>1</sup>Impact Categories refer to the EIR chapter headings and appear in the same order as the sections.  
<sup>2</sup>Positive or beneficial impacts of the trail are depicted in *italics*.

Table 1-2

## Proposed Bay Trail Alignment Summary of Impacts and Mitigations

| Impact Category <sup>1</sup> | Impacts <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Recommended Mitigations                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Land Use, cont'd             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                              | 8. The potential for litter problems would be greatest in areas of rest and congregation (e.g., staging areas, parks, BCDC shoreline access, picnic areas).                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Policy 13 recommends use of existing staging areas to encourage congregation where facilities are available.</li> <li>• The draft Bay Trail Plan proposes no new picnic or staging areas.</li> <li>• The effects of littering can be minimized through: 1) trash containers placed at convenient locations; 2) appropriate signage; and 3) volunteer or contract labor to periodically pick up litter.</li> </ul> |
|                              | 9. The increased activity on existing trail segments may lead to overuse. Some sections of trail may receive more traffic than existing design would safely accommodate.                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• Overuse may require trail redesign for site-specific response. Mitigations could include: trail improvements (striping, widening, signage), construction of an additional trail to separate user groups, and realignment of the trail to bypass congested areas.</li> </ul>                                                                                                                                       |
|                              | 10. Changing land uses and development patterns in the vicinity of the trail could require trail realignment or design changes.                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• City and County general plans should be amended to include the Bay Trail, so that the alignment can be considered in local land use planning.</li> </ul>                                                                                                                                                                                                                                                          |
|                              | 11. Cities and counties around the Bay may not currently have a designated bay shoreline trail in their bikeway/trails masterplans or parks and recreation elements.                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• City and County general plans should be amended to include the Bay Trail, so that the alignment can be considered in local land use planning.</li> </ul>                                                                                                                                                                                                                                                          |
|                              | 12. <i>New class I trail segments would generally be compatible in residential areas as linear parks, provided there is sufficient right-of-way to offer a buffer for the residences adjacent the trail. If the trail is well-integrated into a residential area, it could become an amenity, increasing residents' recreational opportunities, improving their access to parks connected by the trail, and enhancing the overall quality of the local environment.</i> | <ul style="list-style-type: none"> <li>• None required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |
|                              | 13. <i>In retail or neighborhood commercial areas, the trail may benefit local commerce by providing an additional source of customers for selected retail activities.</i>                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• None required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |
|                              | 14. <i>Where the trail is proximate to employment centers, it can fill previously-unmet recreational needs of workers.</i>                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• None required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |

<sup>1</sup> Impact Categories refer to the EIR chapter headings and appear in the same order as the sections.

<sup>2</sup> Positive or beneficial impacts of the trail are depicted in *italics*.

Table 1-2

## Proposed Bay Trail Alignment Summary of Impacts and Mitigations

| <u>Impact Category</u> <sup>1</sup>     | <u>Impacts</u> <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <u>Recommended Mitigations</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Housing and Economic Development</b> | <ol style="list-style-type: none"> <li>Noise and loss of privacy may negatively impact residences immediately adjacent to the trail.</li> <li>Trail development has the potential to increase crime in residential and commercial areas.</li> <li>Trail users' need for parking near the trail could impact adjacent residential and commercial areas.</li> <li><i>The trail may increase the value of near-by residences.</i></li> <li><i>The trail may be used for local trips and commuting, reducing the overall increase of traffic associated with the trail.</i></li> <li><i>Development of class I or II bicycle paths may provide greater safety from vehicles than the current use of public streets.</i></li> <li><i>Trail may provide an additional source of customers for retail activities along the trail route.</i></li> <li><i>The Plan furthers many cities' goals for waterfront development.</i></li> </ol> | <ul style="list-style-type: none"> <li>Details of the project design (distance between the trail and development, fencing, landscaping, use of natural topography) can buffer noise and privacy impacts.</li> <li>See Land Use mitigation #5.</li> <li>See Traffic and Circulation mitigation #1.</li> <li>None required.</li> <li>None required.</li> <li>None required.</li> <li>None required.</li> <li>None required.</li> </ul>                                                                                                                                                                                                                                                                       |
| <b>Traffic and Circulation</b>          | <ol style="list-style-type: none"> <li>In the long term, trail users' traffic to staging areas could exceed the current parking and circulation system capacity. Overflow parking and street congestion in the vicinity may result.</li> <li>Neighborhoods which have easy access to the trail could become unofficial staging areas, creating the potential for impacted neighborhood parking, crime, and soil erosion from use of undesignated trails.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Publicize transit connections, where they exist, to provide alternative access to the trail.</li> <li>Negotiate joint use of private parking near the trail for additional staging areas.</li> <li>Conduct periodic review of traffic conditions at staging areas; New staging areas should be added as needed, impacted staging areas should be discontinued as official trail staging locations, and designated staging areas should be well advertised.</li> <li>Policy 17 recommends designing and routing the trail to discourage use of undesignated trails. Barriers should be established to discourage use of undesignated trail access points.</li> </ul> |

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<sup>2</sup> Positive or beneficial impacts of the trail are depicted in *italics*.

Table 1-2

## Proposed Bay Trail Alignment Summary of Impacts and Mitigations

| Impact Category <sup>1</sup>    | Impacts <sup>2</sup>                                                                                                                       | Recommended Mitigations                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Traffic and Circulation, cont'd |                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                 | 3. Trail construction may divert and/or slow traffic.                                                                                      | <ul style="list-style-type: none"> <li>Trail construction that would impact the flow of traffic should be limited to non-commute hours.</li> </ul>                                                                                                                                                                                                                                                                                                    |
|                                 | 4. Possible loss of curb parking associated with class II bicycle facility construction could create impacted parking on adjacent streets. | <ul style="list-style-type: none"> <li>Where removal of curb parking is necessary to install class II bicycle lanes, the increased safety afforded bicyclists by removing curb parking needs to be weighed on a project-specific basis against the impact of increasing the demand for parking elsewhere.</li> </ul>                                                                                                                                  |
|                                 |                                                                                                                                            | <ul style="list-style-type: none"> <li>Consider alternatives to removal of curb parking. These include road widening to accommodate a class II bicycle lane or establishing a class III bicycle route.</li> </ul>                                                                                                                                                                                                                                     |
|                                 | 5. There are potential alignment conflicts with highway widenings, interchange improvements and other subregional transportation projects. | <ul style="list-style-type: none"> <li>Highway/trail alignment conflict should be resolved through project design. Where design solution is not possible, trail may need to be realigned.</li> </ul>                                                                                                                                                                                                                                                  |
|                                 | 6. There is the potential for hazardous conflict between bicyclists and vehicles on public streets.                                        | <ul style="list-style-type: none"> <li>Class I trails are preferred for safety from vehicle conflicts where economically and physically feasible.</li> </ul>                                                                                                                                                                                                                                                                                          |
|                                 | 7. Bicyclists who do not observe rules of the road may create hazards to drivers.                                                          | <ul style="list-style-type: none"> <li>Increased law enforcement may be required at locations where patterned violation occurs.</li> </ul>                                                                                                                                                                                                                                                                                                            |
|                                 | 8. Truck traffic presents a higher potential for conflict with bicyclists using the same street.                                           | <ul style="list-style-type: none"> <li>Specifics of potential conflicts should be reviewed by a traffic engineer for appropriate mitigation. Mitigation measures could include warning signage, reduction of truck speed, installation of rumble strips on blind curves, restriction of truck traffic to local destinations, road widening to accommodate a class II lane safely, creation of a class I trail or realignment of the trail.</li> </ul> |
|                                 | 9. There is a potential for trail user/train conflict where the trail parallels an active railroad line.                                   | <ul style="list-style-type: none"> <li>Project level design should consider the following: fencing, cautionary signing; wide buffers between the trail and rail line; keeping the trail surface well maintained and attractive to use; aligning the trail, access, parking and support facilities on one side of the tracks with a barrier to the rail line.</li> </ul>                                                                               |
|                                 | 10. The Plan will create a public policy to provide trail access across vehicle bridges.                                                   | <ul style="list-style-type: none"> <li>Bridge access may be achieved through the retrofitting of existing bridges to accommodate class I trails, providing shuttle service, equipping buses to carry bicycles, allowing bicycles on road shoulders and requiring trail access on new bridges. Implementing agencies should work with CalTrans to define and carry out effective solutions.</li> </ul>                                                 |

<sup>1</sup> Impact Categories refer to the EIR chapter headings and appear in the same order as the sections.

<sup>2</sup> Positive or beneficial impacts of the trail are depicted in *italics*.

## Proposed Bay Trail Alignment Summary of Impacts and Mitigations

| <u>Impact Category</u> <sup>1</sup>    | <u>Impacts</u> <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <u>Recommended Mitigations</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Traffic and Circulation, cont'd</b> | <ol style="list-style-type: none"> <li>11. Development of the trail could increase the demand for public transit to accommodate bicycles.</li> <li>12. Trail users may demand increased transit to the trail, especially on weekends and holidays.</li> <li>13. A portion of the traffic to the trail can be expected to be captured from other subregional recreational destinations. Location-specific impacts and appropriate mitigations need to be addressed at the project level.</li> <li>14. On high traffic volume streets, bicyclists may be inclined to avoid the segment altogether or to divert off the trail to more traffic-free streets.</li> <li>15. <i>The proximity of the trail to ferry terminals and marinas may increase ferry ridership and use of ferries as water trails.</i></li> <li>16. <i>Trail access and departure by transit at different locations would allow a non-looping excursion and thereby enhance the trail experience.</i></li> <li>17. <i>Transit service to the trail would provide access to a wider group of trail users than without such service.</i></li> <li>18. <i>Public transit to the trail would lessen the potential air pollution, traffic and parking congestion impacts associated with vehicle access alone.</i></li> </ol> | <ul style="list-style-type: none"> <li>• Transit agencies should be encouraged to evaluate alternatives and retrofit selected buses with bicycle carrying equipment.</li> <li>• Transit service may be improved through route restructuring, better transit connections, and schedule trade-offs.</li> <li>• None required.</li> <li>• None required.</li> <li>• None required.</li> <li>• None required.</li> <li>• None required.</li> <li>• None required.</li> </ul>                                                                                                                                                                     |
| <b>Hydrology and Flooding</b>          | <ol style="list-style-type: none"> <li>1. Construction of the trail could impede drainage.</li> <li>2. There is a potential for degraded water quality from sedimentation and litter decomposition.</li> <li>3. Flood control district operations, particularly channel clearing, could effect the design of the trail over and along creeks.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• Flood control districts and local public works departments should review trail drainage plans at the project level for adequacy.</li> <li>• Employ site-specific erosion control techniques, curb littering with convenient trash receptacles and install signing to discourage littering and keep people on the trail. Erosion control could include dry weather construction, trapping sediment, minimized grading area and revegetation.</li> <li>• At the project design phase, assess alternative trail surfaces and trail designs for compatibility with flood control operations.</li> </ul> |

<sup>1</sup>Impact Categories refer to the EIR chapter headings and appear in the same order as the sections.<sup>2</sup>Positive or beneficial impacts of the trail are depicted in *italics*.

Table 1-2

## Proposed Bay Trail Alignment Summary of Impacts and Mitigations

| Impact Category <sup>1</sup>          | Impacts <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Recommended Mitigations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hydrology and Flooding, cont'd</b> | <ol style="list-style-type: none"> <li>Where the trail would be on top of levees that will need to be raised or repaired, an asphalt trail surface may not be warranted.</li> <li>Flooding of the trail has the potential to damage the trail, particularly sections of asphalt construction.</li> <li>The trail's alignment on flood plains, over and along streams and flood control channels, and near bay tides can pose a safety hazard to trail users.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>Policy 21 requires trail design to be appropriate to terrain. Alternative trail surfaces should be investigated, including simple grading, compacted gravel, and prefabricated boardwalk sections that can be disassembled and removed for levee work.</li> <li>Trail segments which cannot be protected from recurrent flooding should be considered for permeable trail surface materials to minimize damage.</li> <li>Potentially hazardous trail alignments could require realignment, or be mitigated by raising the trail above the 100-year flood elevation, installing safety barriers, or development a program to close the trail during hazardous periods.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Geology and Soils</b>              | <ol style="list-style-type: none"> <li>As grades increase beyond 2 percent, use of the trail will be increasingly constrained for trail users with mobility limitations. The steepness of the trail and length of grade could be significant factors in determining the distribution of trail users on the trail.</li> <li>The trail may be subject to a wide variety of geophysical hazards: soil settlement, expansive soils, earthquake, liquefaction, and landslide.</li> <li>Expansive soils would subject a trail surface to seasonal movement and stress.</li> <li>Landslides may cover the trail, take the trail with it, or undercut the trail.</li> <li>Levees made from wet sludge can be expected to be closed for trail use for up to two years after filling before the material dries sufficiently for trail grading.</li> <li>There would be potential erosion and sedimentation from trail construction, road widening and shoulder paving.</li> </ol> | <ul style="list-style-type: none"> <li>The Plan's design guidelines propose a maximum of 5 percent grade over short distances to accommodate the widest possible range of trail users.</li> <li>Policy 19 recommends that the trailhead signing program include information describing the relative difficulty of the trail.</li> <li>CalTrans bikeway structural section standards are recommended as the minimum standards for an asphalt trail that will meet a variety of geophysical stresses and hazards. To increase resilience to stresses 5-1/2 to 6 percent asphalt content, good maintenance, slurry seal and increased thicknesses of base and surface, as necessary, are recommended.</li> <li>A cement treated trail base can mitigate the damage caused by extremely expansive soils.</li> <li>Damage from landslides can be limited by protective retaining walls and debris fences, filter fabric or gunite on cut slopes, maximizing the distance between the trail and landslide hazards, and other techniques as recommended by a soils engineer.</li> <li>At the time of project implementation, alternative routes should be determined for segments that can be expected to have extend periods of closure.</li> <li>See Hydrology and Flooding mitigation #2.</li> </ul> |

<sup>1</sup>Impact Categories refer to the EIR chapter headings and appear in the same order as the sections.

<sup>2</sup>Positive or beneficial impacts of the trail are depicted in *italics*.

Table 1-2

## Proposed Bay Trail Alignment Summary of Impacts and Mitigations

| Impact Category <sup>1</sup>   | Impacts <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Recommended Mitigations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vegetation and Wildlife</b> | <ol style="list-style-type: none"> <li>1. Development and use of a trail has the potential to impact the ecological equilibrium through soil erosion, sedimentation, removal of riparian vegetation, and use of chemicals.</li> <li>2. Trail alignment and use could impact wildlife through degradation or loss of habitat, predation, and disturbance by humans.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>• The Plan includes policies to protect sensitive environments. The trail alignment does not propose any new fill in known marshlands. For soil erosion and sediment mitigations see Hydrology and Flooding. Site specific environmental review will be required at the time of project implementation.</li> <li>• Buffers to view of and sound from trail users may be the most effective wildlife protection from disturbance.</li> <li>• The Plan proposes a policy to prohibit domestic animals from the trail (consistent with local regulations).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Air Quality</b>             | <ol style="list-style-type: none"> <li>3. <i>The Plan may improve the public's knowledge and appreciation of the Bay's resources, in turn motivating public support for bay and wildlife conservation.</i></li> <li>1. Construction vehicles and equipment, and worker commute vehicles would emit exhaust and generate dust at the sites. Given the small number of vehicles to be involved in trail segment construction at a given time and the relatively short segments of trail to be built over the multi-year implementation period, both the local and the regional impacts of these emissions would be negligible.</li> <li>2. Vehicles driving to and from the staging areas would be a contributing source of air pollutants.</li> </ol> | <ul style="list-style-type: none"> <li>• Signs advising users to stay on the trail, policing, docent and education programs should be investigated to encourage proper trail use.</li> <li>• Site-specific wildlife impacts should be reviewed at the time of project implementation.</li> <li>• None required.</li> <li>• Where the trail would be constructed as a class I path during the dry season, unpaved construction sites should be sprinkled with water twice daily. Disturbance of soil should be minimized. Stockpiles of dirt or sand should be covered. Any trucks on the construction site hauling soil, sand or debris should be kept covered.</li> <li>• Construction equipment engines should not be kept idling when they are not being operated and should receive periodic maintenance.</li> <li>• Additional emissions would be somewhat offset by bicyclists using the trail system as an alternate transportation route, particularly those who are commuting or using it for other non-recreational purposes. See also Traffic and Circulation for additional measures.</li> </ul> |

<sup>1</sup>Impact Categories refer to the EIR chapter headings and appear in the same order as the sections.

<sup>2</sup>Positive or beneficial impacts of the trail are depicted in *italics*.

Table 1-2

Proposed Bay Trail Alignment  
Summary of Impacts and Mitigations

| Impact Category <sup>1</sup>  | Impacts <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Recommended Mitigations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Noise                         | <ol style="list-style-type: none"><li>1. Daylight noise levels would increase in residential areas of the trail, particularly on weekends and holidays. These increases would be intermittent only, but may be annoying for adjacent residents.</li><li>2. The trail alignment would generate increase human activity and noise from vehicles at staging areas and at other points of congregation like picnic areas and restrooms. Unlike the trail alignment, these would represent relatively stationary noise sources.</li><li>3. Human voices may have a disturbing influence on the feeding and nesting habits of some waterfowl and shorebirds in coastal marshes.</li></ol> | <ul style="list-style-type: none"><li>• An appropriate buffer strip should separate new class I segments of the trail from residential neighborhoods. Suggested buffer width is 20 feet. Vegetative screening should also be planted where needed. Wherever the trail passes close to residential areas, signs should be posted to request users to respect the privacy of adjacent residents.</li><li>• No new staging areas are proposed in the Plan. When additional staging areas are proposed in the future, noise impacts will be evaluated during project environmental review.</li><li>• Where wetland areas are crossed by existing levees and trails, signs should be periodically posted requesting that people pass quietly to avoid disturbing the wildlife. See also Vegetation and Wildlife.</li><li>• None required now. Specific facility upgrading requirements should be reviewed at the project-level phase and be expanded as needed.</li><li>• Cultural resource sites should be identified at the project level. Whenever such sites are anticipated, the lead agency staff should require a field reconnaissance by a qualified archaeologist. If cultural resources are encountered, on-site preservation is advocated to avoid destruction.</li></ul> |
| Public Services and Utilities | <ol style="list-style-type: none"><li>1. Adoption of the Bay Trail Plan will not increase the need for public services or utilities. Development of the trail is likely to attract new users to existing trails and facilities and may create service and utility needs in excess of existing supply. The local trail development/maintenance agency may have to allocate increased financial support to meet public service needs.</li></ol>                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Cultural Resources            | <ol style="list-style-type: none"><li>1. Potential archaeological sites may be located at relatively undisturbed bayshore areas and along streams that are part of the trail system. Potential archaeological sites would be primarily related to middens, burial, camp and village sites.</li></ol>                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

<sup>1</sup>Impact Categories refer to the EIR chapter headings and appear in the same order as the sections.

<sup>2</sup>Positive or beneficial impacts of the trail are depicted in *italics*.



---

## 2. Introduction

---

### 2.1 Type and Focus of this Document

This is an Environmental Impact Report (EIR) prepared by the Association of Bay Area Governments in compliance with the California Environmental Quality Act (CEQA) guidelines. Following public review, a Final EIR will be prepared, responding to the comments received from the public and interested agencies.

This document is a program EIR. As a program EIR, this analysis examines the categorical and region-wide effects of the Bay Trail Plan. The CEQA guidelines define a program EIR:

A program EIR is an EIR which may be prepared on a series of actions that can be characterized as one large project and are related either:

- (1) Geographically,
- (2) As logical parts in the chain of contemplated actions,
- (3) In connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program, or
- (4) As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects which can be mitigated in similar ways.<sup>1</sup>

It is important to note that the broad scope of the draft Bay Trail Plan and the likelihood of implementation through the independent actions of numerous local and regional agencies prevents this program EIR from systematically and thoroughly addressing site-specific impacts. These should be addressed at the project level, when specific site requirements can be determined.

### 2.2 Role of the EIR

This document has been prepared to meet the requirements of CEQA, and to inform the public about the potential environmental effects of the draft Bay Trail Plan, to identify possible ways to mitigate the potential impacts, and to describe alternatives to the proposed Bay Trail Plan. As a program analysis, this document emphasizes the project's regional setting and the classes of possible impacts, as opposed to site-specific effects. Its delineation of impacts and proposed mitigation measures can serve as a guide for the project-level environmental review which will occur as individual trail segments are developed to implement this regional trail program. Subsequent environmental analysis can more readily focus on likely areas of impact.

While this EIR represents a regional, programmatic perspective, site-specific references have occasionally been included to illustrate potential impacts. Proposed mitigation measures can be incorporated into the final Bay Trail Plan as additional policies, where appropriate, or they can be applied by implementing agencies as part of the local trail segment planning and development process.

Many of the potential impacts of the Bay Trail Plan were avoided due to the nature of the planning process itself. The selection of the Bay Trail alignment has been guided by the dictates of the Bay Trail's authorizing legislation, SB100, which is discussed below, and the draft Bay Trail policies, which were designed specifically to mitigate certain negative environmental effects of the trail alignment.

---

<sup>1</sup>California Environmental Quality Act Guidelines, Section 15168.



## 2.3 Project Description

The Bay Trail Plan proposes a 400-mile regional recreational hiking and bicycling trail system for the San Francisco Bay Area. The plan was developed pursuant to SB 100 (Lockyer), which authorized the Association of Bay Area Governments (ABAG) to develop and adopt a plan and implementation program for a continuous recreational hiking and bicycling trail around San Francisco and San Pablo Bays.<sup>2</sup> The legislation requires the plan to:

- (1) show the relationship between the trail route and existing park and recreation facilities;
- (2) identify links to existing and proposed public transportation facilities;
- (3) provide that designated environmentally sensitive areas, including wildlife habitats and wetlands, shall not be adversely affected by the trail;
- (4) provide for appropriate buffer zones along those portions of the bikeway system adjacent to designated environmentally sensitive areas;
- (5) provide that the land and funds used for trail construction and planning are not considered mitigation for wetland losses;
- (6) provide alternative routes to avoid impingement on environmentally sensitive areas; and
- (7) provide that no motorized vehicles, except to the extent necessary for emergency services, be allowed on the trail.<sup>3</sup>

The draft Bay Trail Plan consists of two components. Draft policies, which direct the routing of the trail, appear in Table 1-1. The proposed Bay Trail alignment is illustrated in Figure 2-1 and Figure 2-2.

### Bay Trail Policies

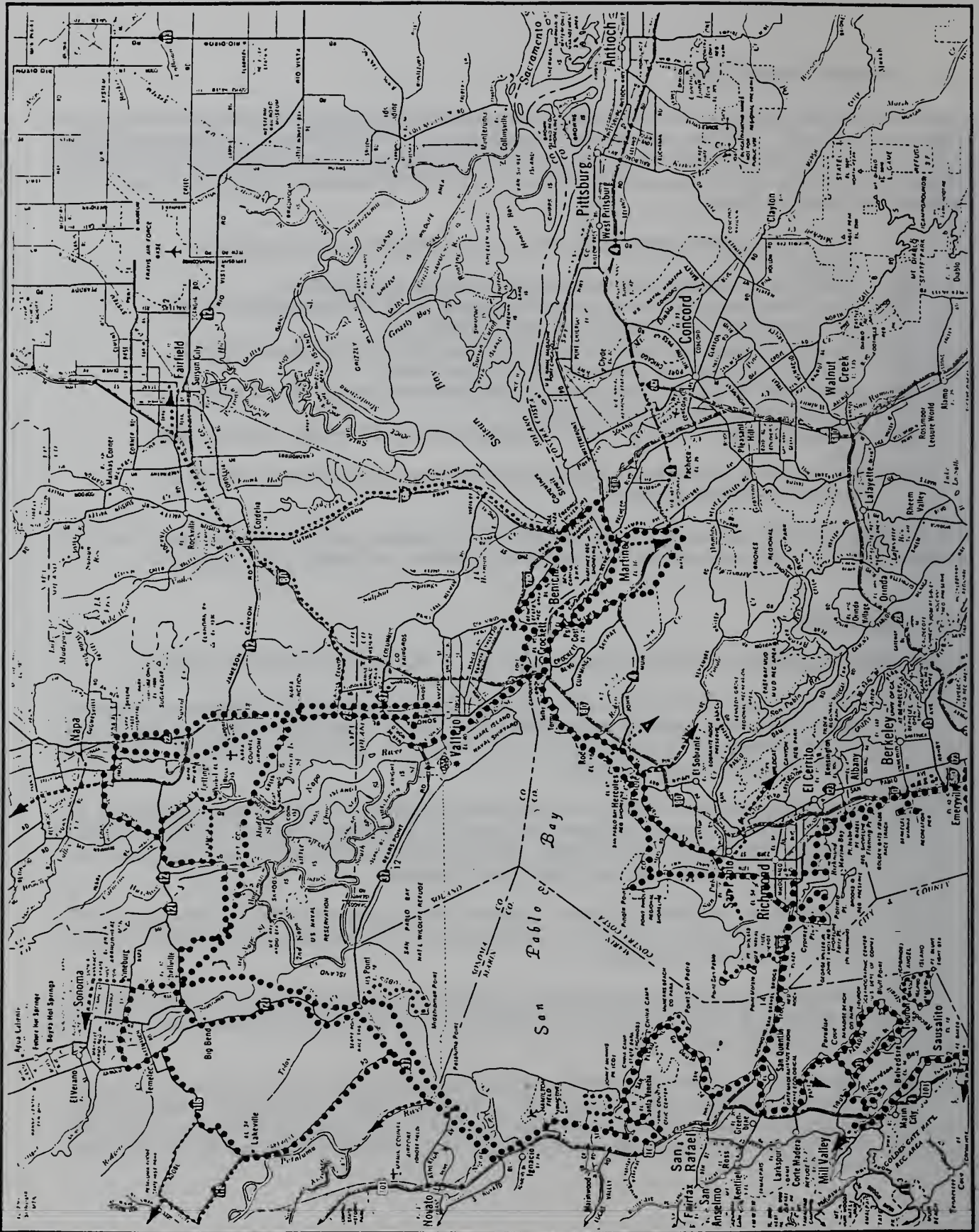
The full text of the draft Bay Trail policies appears in Table 1-1. The policies fall into five categories:

- 1) *Trail alignment policies* reflect the program's goals to develop a continuous trail which highlights the wide variety of recreational and interpretive experiences offered by the diverse bay environment and is situated as close as feasible to the shoreline, within the constraints defined by other policies of the plan.
- 2) *Trail design policies* underscore the importance of creating a trail which is accessible to the widest possible range of trail users and which is designed to respect the natural or built environments through which it passes. Minimum design guidelines for trail development are recommended for application by implementing agencies.
- 3) *Environmental protection policies* underscore the importance of the San Francisco Bay's natural environment and define the relationship of the proposed trail to sensitive natural environments such as wetlands.
- 4) *Transportation access policies* reflect the need for bicycle and pedestrian access on Bay Area toll bridges, in order to create a continuous trail and to permit cross-bay connections as alternative trail routes.
- 5) *Implementation policies* state that successful implementation of the Bay Trail Plan will require continuing trail advocacy, oversight, and a structure for trail management. The preliminary recommendations presented in the draft Plan will be the subject of continued study by the Bay Trail Advisory Committee in the spring of 1989. Refined policies will be included in the final plan.

---

<sup>2</sup>State of California Public Resources Code, Division 5, Chapter 11, Section 5850 et seq.

<sup>3</sup>Ibid.



- Spine Trail    ●●●●●
- Spur Trail    - - - ●●●●
- Connector Trail    - - - - ->

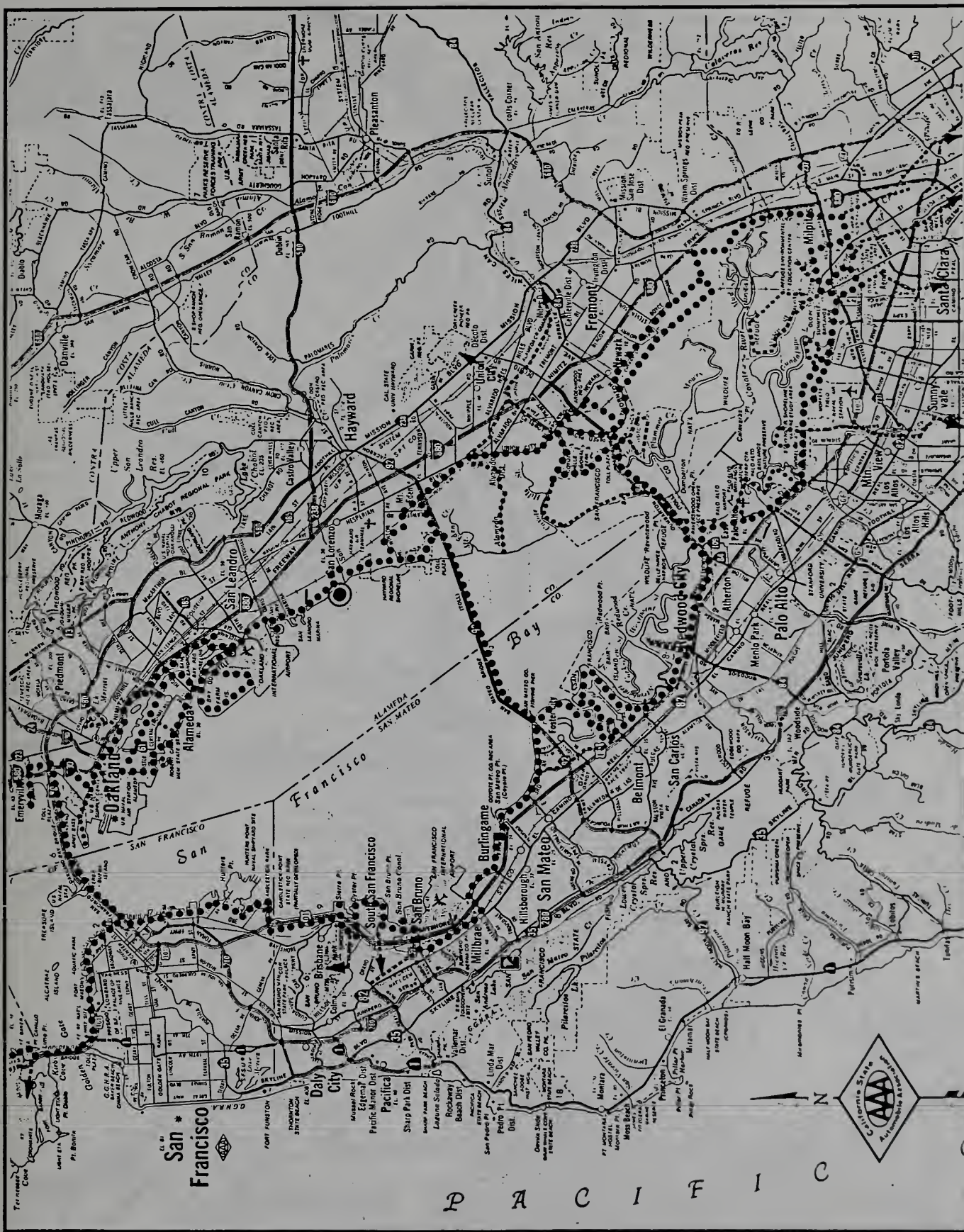
## Proposed Bay Trail

Figure 2-1  
Plate 1

Approx. Scale miles



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- Spine Trail ●●●●●
- Spur Trail ●●●●●
- Connector Trail - - - - -
- Observation Platform ○●

## Proposed Bay Trail

Figure 2-1  
Plate 2

Approx. Scale 0 2 4 miles



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|                 | Proposed  | Existing              |
|-----------------|-----------|-----------------------|
| Spine Trail     | —————     | ●●●●● (path)          |
| Spur Trail      | - - - - - | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | .....     | ●●●●● (same)          |

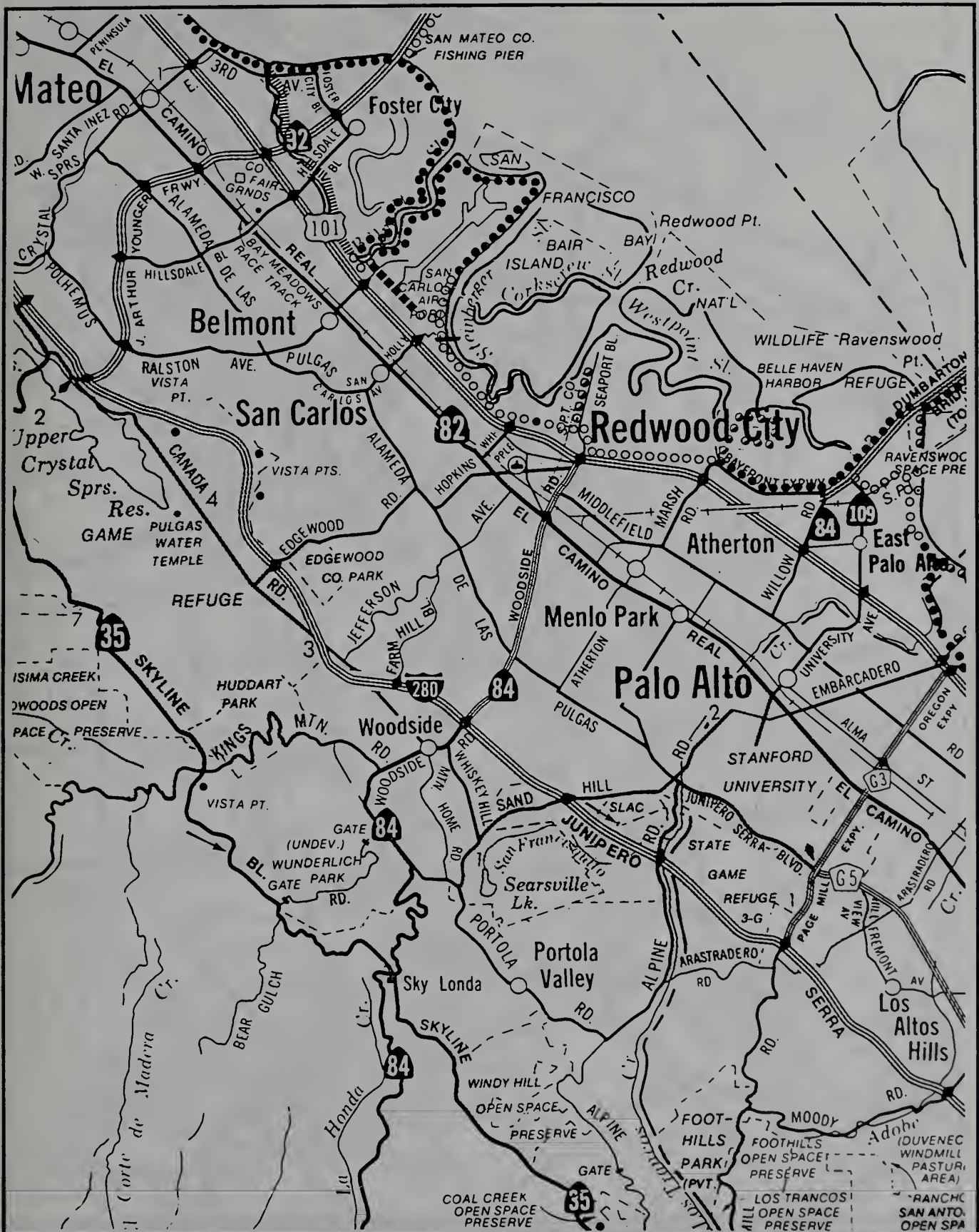
## Bay Trail Alignment

Figure 2-2  
Plate 1

Approx. Scale 0.5 0 1 miles



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|                 | Proposed | Existing              |
|-----------------|----------|-----------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)          |
| Spur Trail      | ○○○○○    | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | ▶        | ●●●●● (same)          |

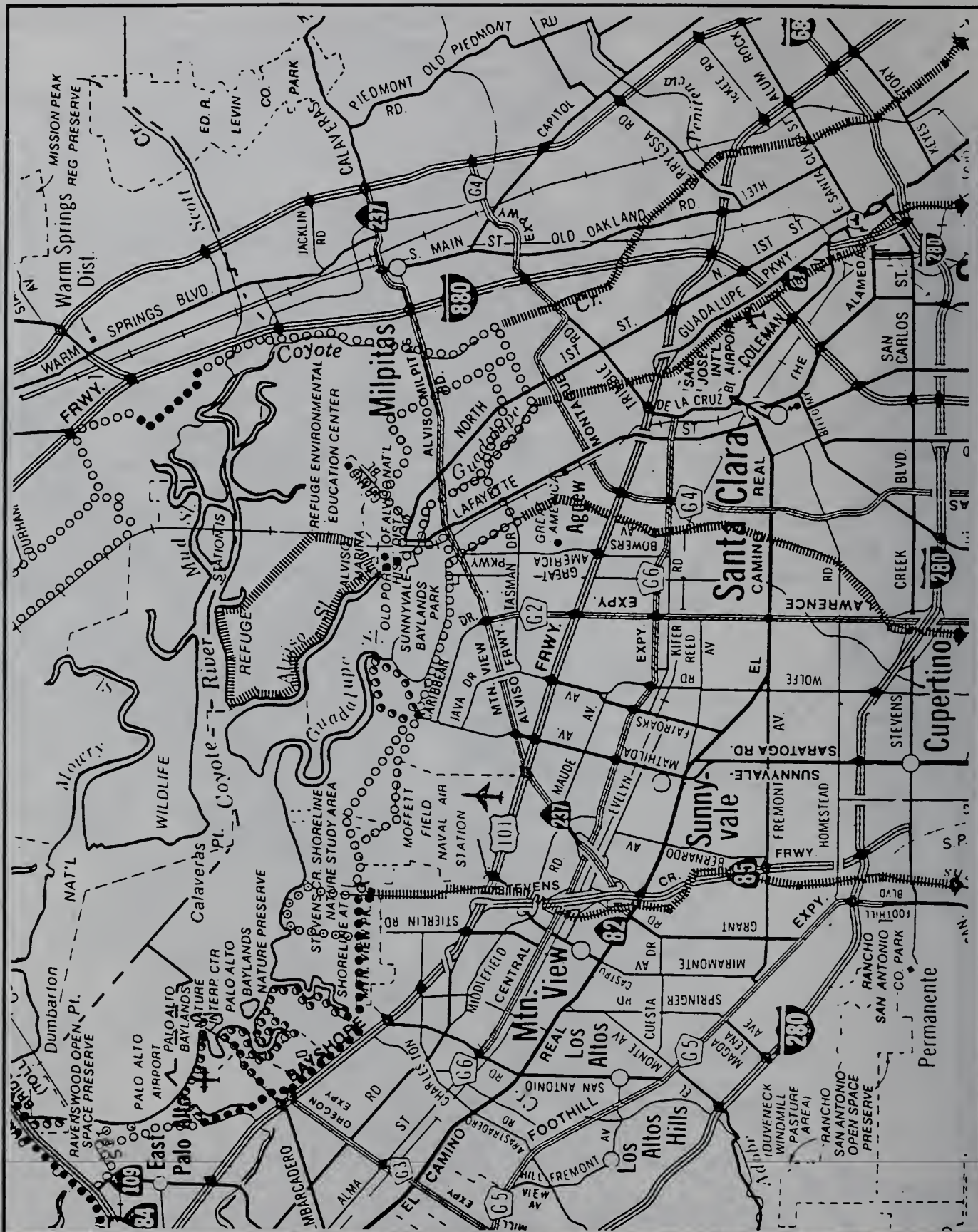
## Bay Trail Alignment

Figure 2-2  
Plate 2

Approx. Scale miles

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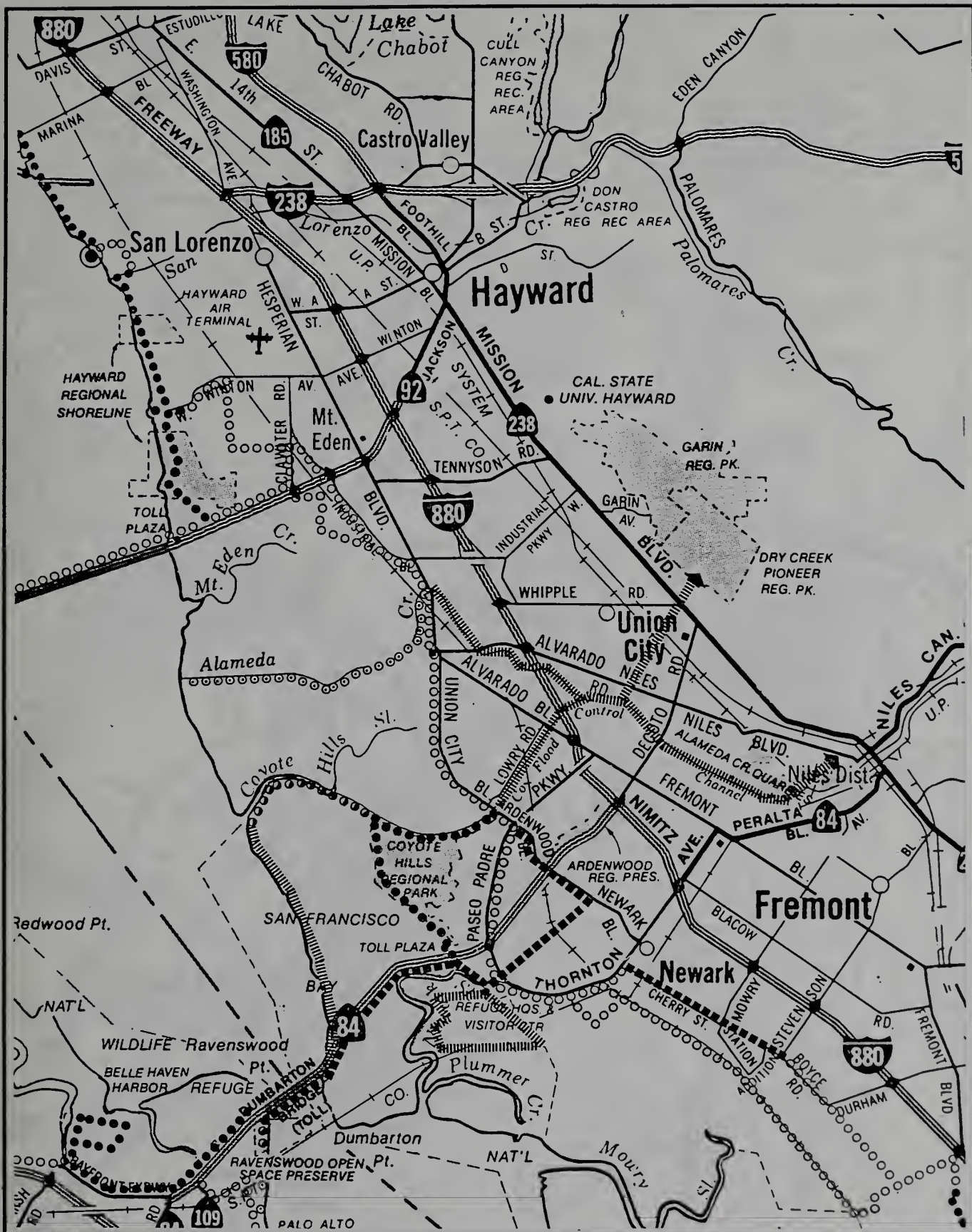
|                 | Proposed | Existing              |
|-----------------|----------|-----------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)          |
| Spur Trail      | ○○○○○    | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | ▶        | ○○○○○ (same)          |

## Bay Trail Alignment

Figure 2-2  
Plate 3

Approx. Scale miles

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|                 | <u>Proposed</u> | <u>Existing</u>                   |
|-----------------|-----------------|-----------------------------------|
| Spine Trail     | ○○○○○           | ●●●●● (path)<br>■■■■■ (bike lane) |
| Spur Trail      | ◎◎◎◎◎           | ●●●●●                             |
| Connector Trail | ~~~~~▶          | (same)                            |

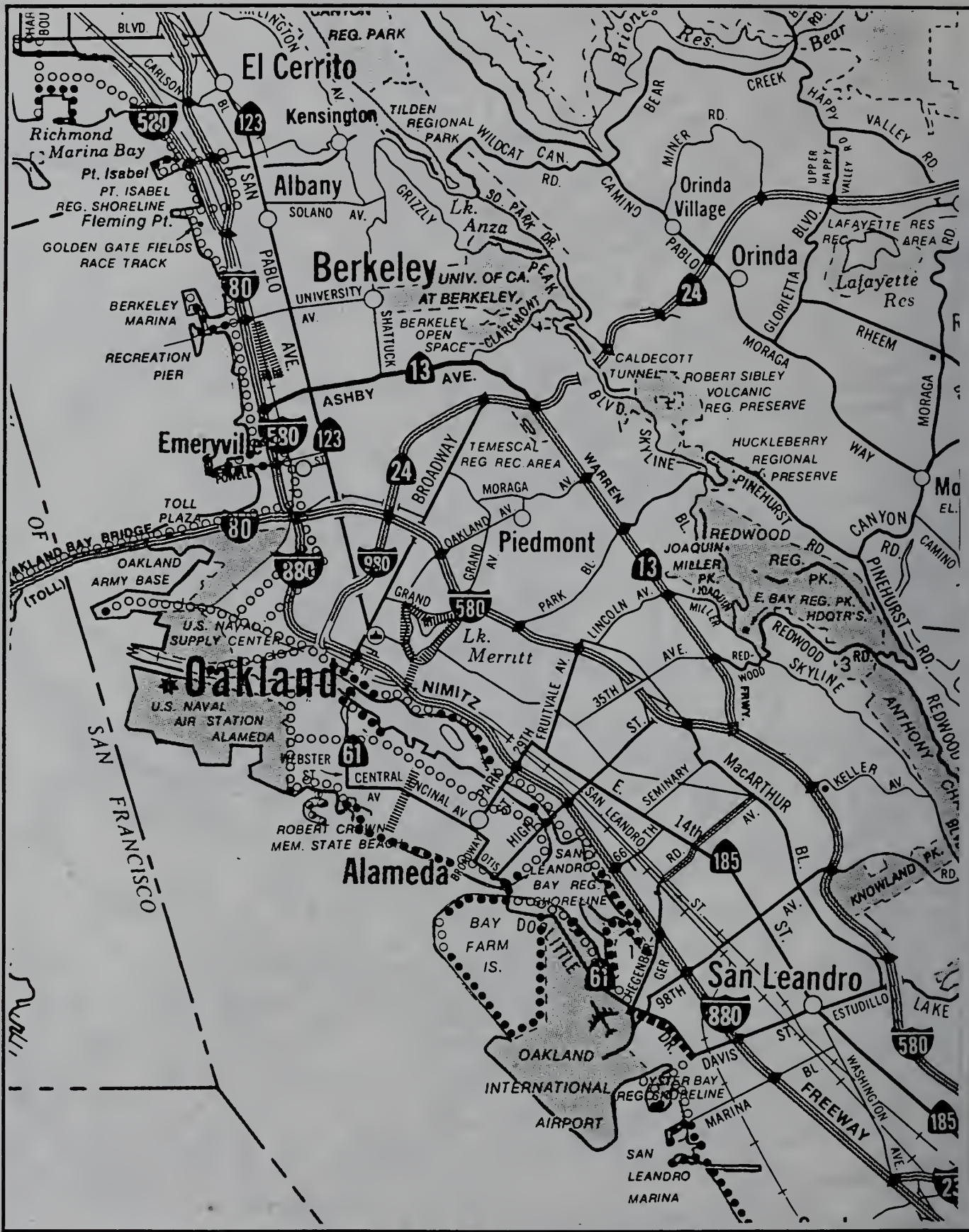
## Bay Trail Alignment

Figure 2-2  
Plate 4

Approx. Scale 0.5 0 1 miles



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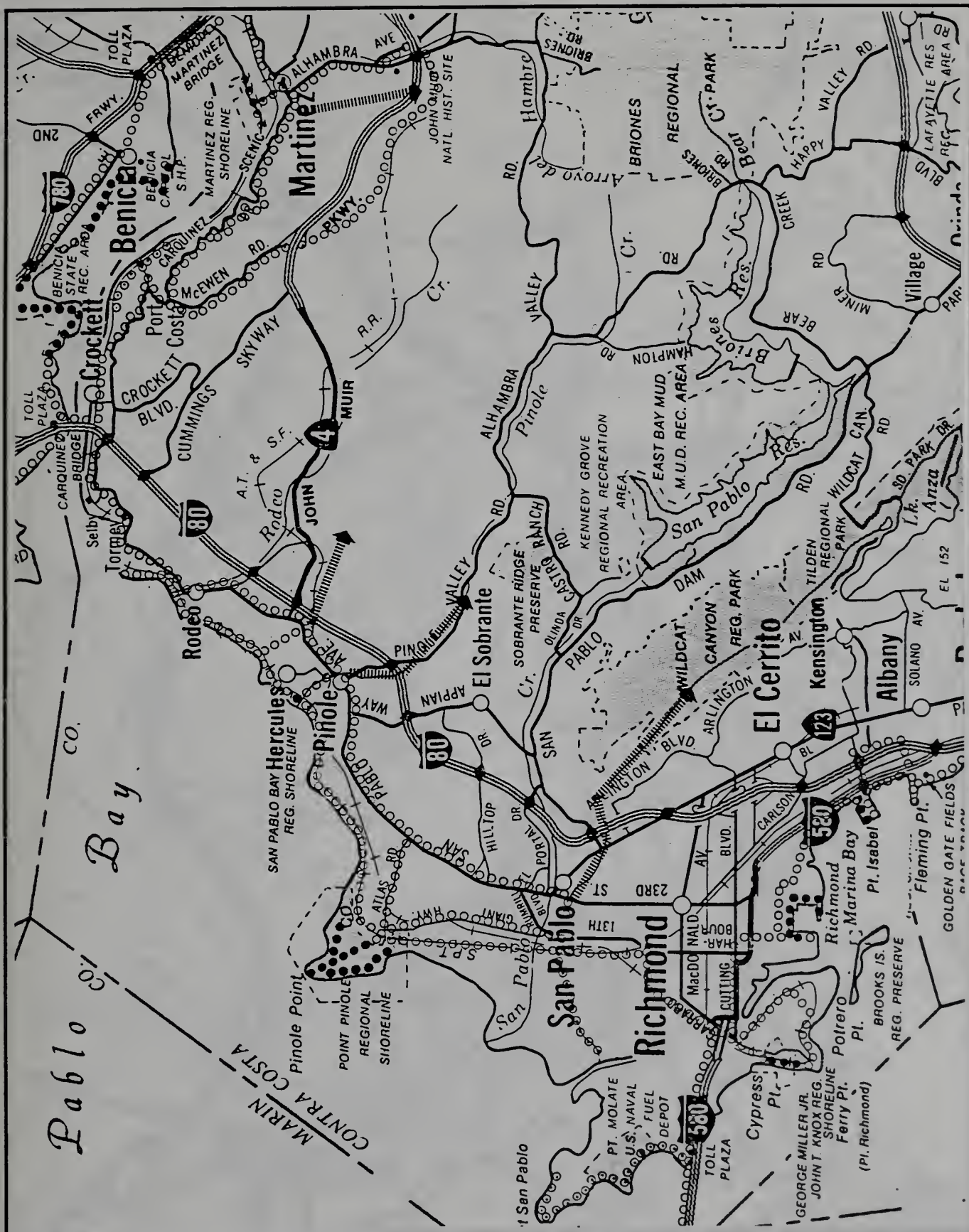
|                 | Proposed | Existing              |
|-----------------|----------|-----------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)          |
| Spur Trail      | ⊙⊙⊙⊙⊙    | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | ▶        | ●●●●● (same)          |

## Bay Trail Alignment

Figure 2-2  
Plate 5

Approx. Scale miles

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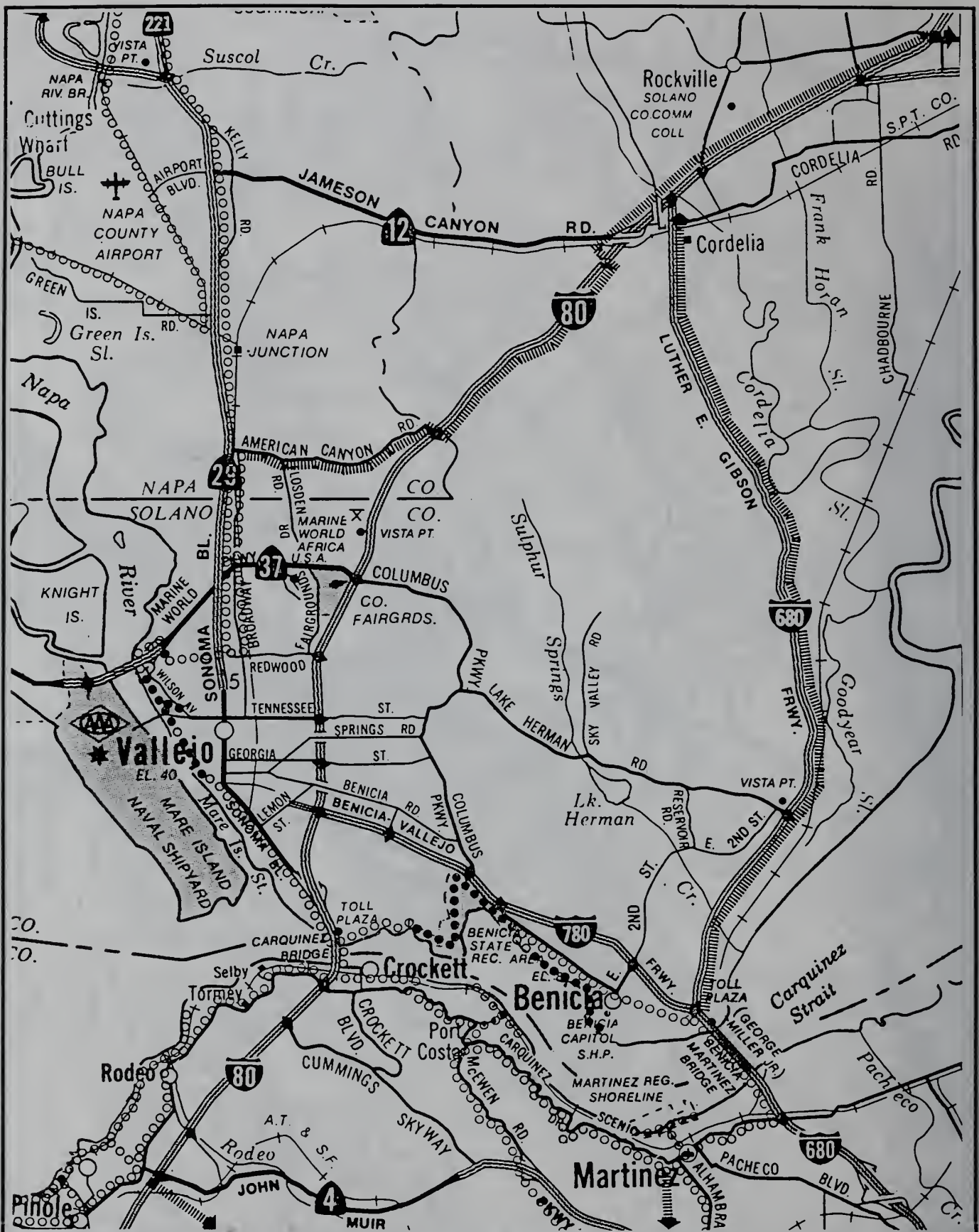
|                 | Proposed | Existing              |
|-----------------|----------|-----------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)          |
| Spur Trail      | ○○○○○    | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | ▶        | ●●●●● (same)          |

## Bay Trail Alignment

Figure 2-2  
Plate 6

Approx. Scale 0.5 0 1 miles

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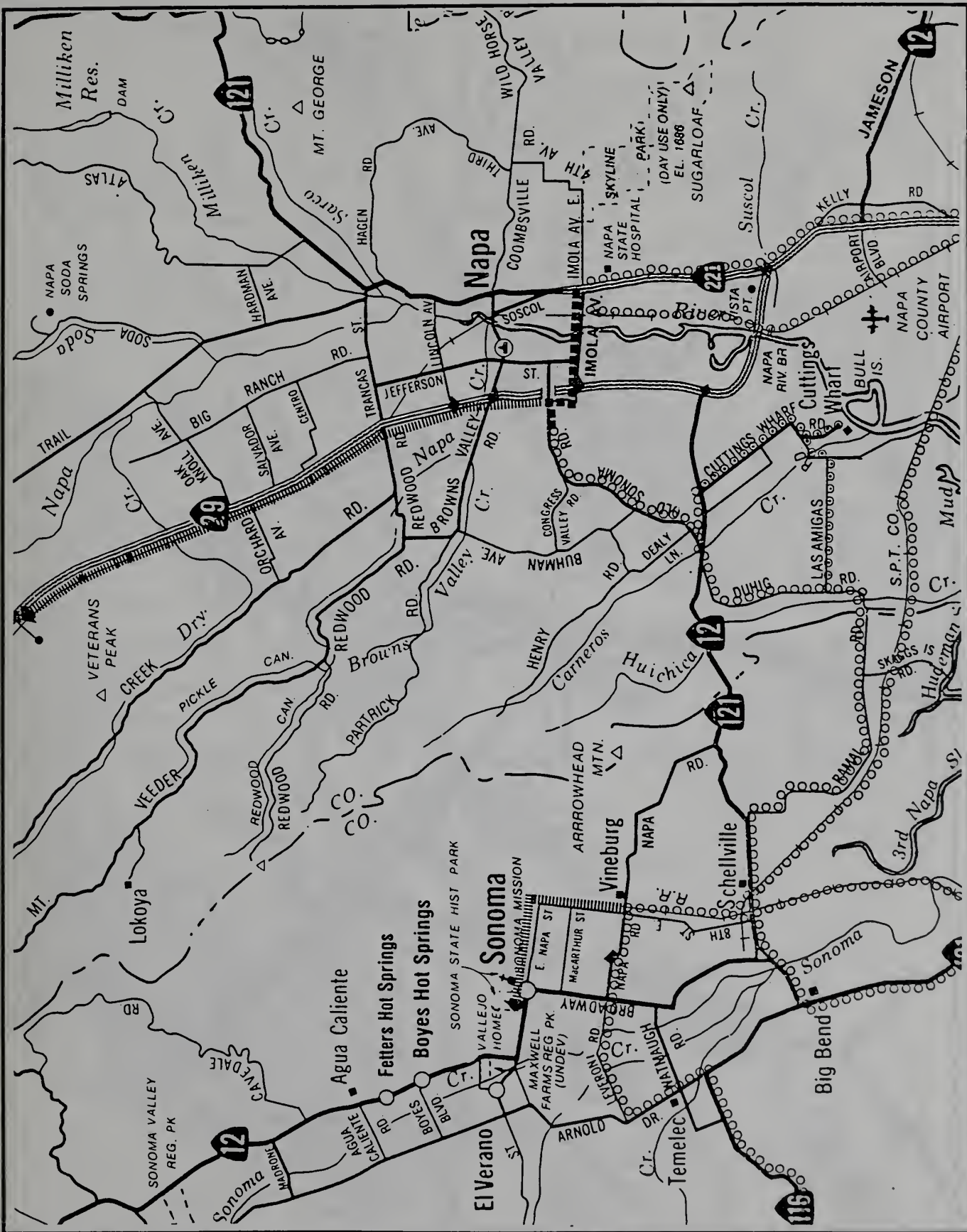


|                 | Proposed | Existing              |
|-----------------|----------|-----------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)          |
| Spur Trail      | ○○○○○    | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | ▶        | ●●●●● (same)          |

**Bay Trail Alignment** Figure 2-2  
Plate 7

Approx. Scale miles

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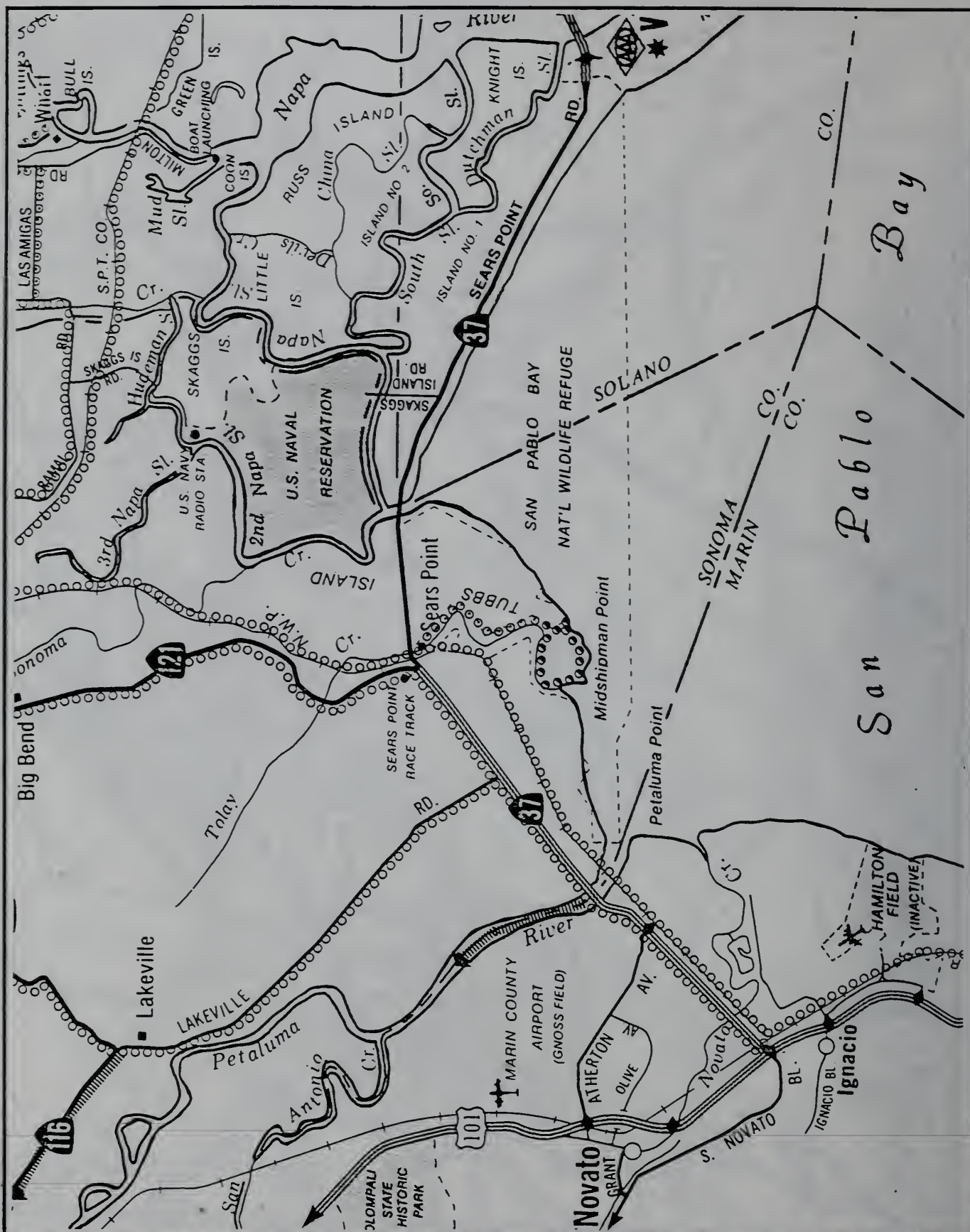
|                 | Proposed | Existing              |
|-----------------|----------|-----------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)          |
| Spur Trail      | ○○○○○    | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | ▶        | ●●●●● (same)          |

## Bay Trail Alignment

Figure 2-2  
Plate 8

Approx. Scale 0.5 0 1 miles

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|                 | Proposed | Existing              |
|-----------------|----------|-----------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)          |
| Spur Trail      | ○○○○○    | ■ ■ ■ ■ ■ (bike lane) |
| Connector Trail | ▶        | ●●●●● (same)          |

## Bay Trail Alignment

Figure 2-2  
Plate 9

Approx. Scale miles



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|                 | Proposed | Existing                          |
|-----------------|----------|-----------------------------------|
| Spine Trail     | ○○○○○    | ●●●●● (path)<br>■■■■■ (bike lane) |
| Spur Trail      | ○○○○○    | ○○○○○                             |
| Connector Trail | ■■■■■▶   | (same)                            |

## Bay Trail Alignment

Figure 2-2  
Plate 10

Approx. Scale miles

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## **Bay Trail Alignment**

The proposed Bay Trail alignment reflects a trail system comprised of three types of trail: spine trails, spur trails, and connector trails. The spine and spur trails create the framework of the Bay Trail system. The spine trail encircles the Bay, providing a continuous recreational corridor which links all nine Bay Area counties. Depending on the location, spine trails may be multiple use trails (hiking and bicycling) or may be restricted to hiking or bicycling only. In some areas, site constraints force the spine trail inland.

Where the spine trail does not follow the shoreline, spur trails provide access from the spine trail to points of interest along the Bay. The spur trails are predominantly existing hiking-only trail segments, which permit restricted access in environmentally-sensitive areas along the shoreline. Table 2-1 identifies the length of existing versus proposed trail for spine and spur segments of the Bay Trail system.

In addition to the spine and spur trails, a series of connector trails has been identified. Connector trails fall into two categories: existing shoreline trails which connect to the Bay Trail but which have not been incorporated as part of the Bay Trail alignment, and trails which provide connections to urban centers inland from the Bay. Trails falling into the first category are primarily those within the San Francisco Bay National Wildlife Refuge. Wildlife Refuge trails are passive, interpretive, rather than active, recreational trails. Their use is restricted to pedestrians only and the trails may be subject to closing during certain times of the year in order to protect nesting wildlife. Trail connections to inland urban centers principally rely on rivers or creeks to provide connections to the Bay. These trail connections are important because they tie residential and employment centers into the Bay Trail system. They also create an alternative means of trail access for users who prefer not to rely solely on automobile transportation to reach staging areas along the shoreline. Some of these connector trails will ultimately serve as links between the Bay Trail and a proposed Ridge Trail, eventually creating a comprehensive regional trail system.

In one location (Robert's Landing in San Leandro), an observation platform is proposed in lieu of a trail connection along the shoreline. This will allow trail users to view, but not disturb, the fragile dune environment at that location.

Because this is a regional trail planning program, it has not been possible to develop specific design guidelines for each trail segment. The draft Bay Trail policies recognize that the natural and built environments through which the trail will pass pose widely divergent trail design requirements. Trails will represent a range of trail designs. Draft trail design policies specify that the trail type and design should be appropriate for the terrain. Table 1-1 contains the recommended minimum design guidelines for Bay Trail development.

As the guidelines indicate, the design of the trail will vary according to the terrain and the nature of the natural or built environment. The trail surface may vary from natural, unimproved or gravel surfaces (appropriate for natural environments) to paved surfaces (suitable for urban locations). Bikeway portions of the trail will meet California Department of Transportation (CalTrans) standards; these are incorporated into the Bay Trail design guidelines. While the guidelines recommend that bikeway portions of the Bay Trail be either class I or class II bikeways, it is likely that all three bikeway types will be represented. The three classes of bikeway are illustrated in Figure 2-3.

Some parts of the trail exist as class I paths--bicycle/pedestrian paths which are separated from traffic. In other areas, proposed alignments follow existing roads and are likely to be developed as on-street bikeways--primarily class II bicycle lanes, separated from traffic by lane striping. Roadway constraints in other locations may require that the trail be developed as a class III bicycle route, identified by signing only, with bicycles sharing right-of-way with motor vehicles.

As Figure 2-2 illustrates, more than one alignment has been proposed in some locations. In some cases, alternatives are proposed for review purposes only, and only one route will be selected for inclusion in the final Bay Trail Plan. In other instances, alternative routes will be included in the final Plan, to provide separate routes for hikers and bicyclists or route separations between through bicycle traffic and slower recreational hiking and bicycling activity.

Table 2-1

| Bay Trail System Length<br>Length of Spine and Spur Trails by County                                                                                                                                                                                                                                                                                                                                                    |                                 |          |             |          |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------|-------------|----------|-------|
| County                                                                                                                                                                                                                                                                                                                                                                                                                  | Trail Segment Length (In miles) |          |             |          |       |
|                                                                                                                                                                                                                                                                                                                                                                                                                         | Spine Trails                    |          | Spur Trails |          | Total |
|                                                                                                                                                                                                                                                                                                                                                                                                                         | Existing                        | Proposed | Existing    | Proposed |       |
| Alameda                                                                                                                                                                                                                                                                                                                                                                                                                 | 41 <sup>1</sup>                 | 70       | 4           | 24       | 139   |
| Contra Costa                                                                                                                                                                                                                                                                                                                                                                                                            | 4                               | 56       | 1           | 7        | 68    |
| Marin                                                                                                                                                                                                                                                                                                                                                                                                                   | 19 <sup>2</sup>                 | 29       | 9           | 4        | 61    |
| Napa                                                                                                                                                                                                                                                                                                                                                                                                                    | 3 <sup>3</sup>                  | 38       | 0           | 4        | 45    |
| San Francisco                                                                                                                                                                                                                                                                                                                                                                                                           | 6                               | 8        | 0           | 1        | 15    |
| San Mateo                                                                                                                                                                                                                                                                                                                                                                                                               | 27 <sup>4</sup>                 | 24       | 3           | 4        | 58    |
| Santa Clara                                                                                                                                                                                                                                                                                                                                                                                                             | 5                               | 25       | 7           | 1        | 38    |
| Solano                                                                                                                                                                                                                                                                                                                                                                                                                  | 56                              | 15       | 0           | 0        | 71    |
| Sonoma                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                               | 53       | 3           | 3        | 59    |
| Total                                                                                                                                                                                                                                                                                                                                                                                                                   | 161                             | 318      | 27          | 48       | 554   |
|                                                                                                                                                                                                                                                                                                                                                                                                                         | 479                             |          | 75          |          |       |
| notes:<br>Trail lengths are generalized and are provided for comparative purposes only, due to the margin of error and the varying scales of resources used to calculate trail mileage.<br><sup>1</sup> includes 9 miles class II bicycle lanes<br><sup>2</sup> includes 3 miles class II bicycle lanes<br><sup>3</sup> includes 3 miles class II bicycle lanes<br><sup>4</sup> includes 2 miles class II bicycle lanes |                                 |          |             |          |       |

Figure 2-3

## Bikeway Classifications

### Class I

#### Bicycle/Pedestrian Path

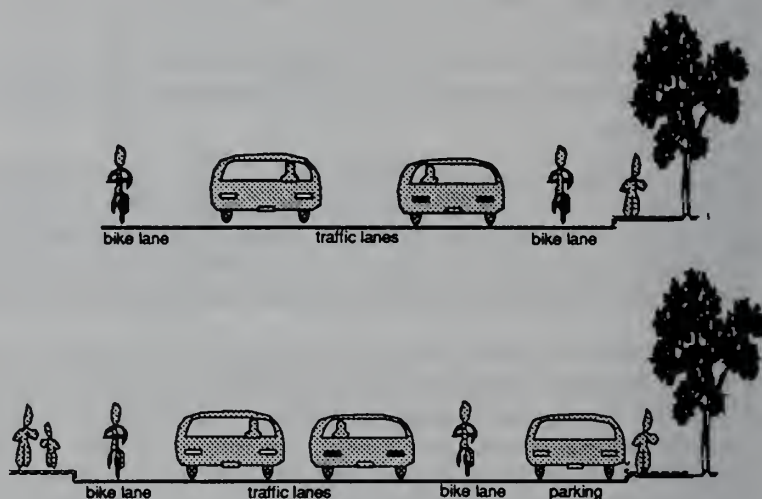
- exclusive right-of-way for bicyclists and pedestrians
- pathway completely separated from motor vehicles by space or physical barrier
- minimal cross-flow by motor vehicles (e.g., at intersections)



### Class II

#### Bicycle Lane

- restricted right-of-way designated for the exclusive flow of bicycles
- travel by motor vehicles or pedestrians prohibited, but vehicle cross-flow allowed for parking and turning
- signed as a bike lane
- lane designated by solid white striping (dashed striping at intersection approaches, where vehicles may cross to make turns)



### Class III

#### Bicycle Route

- shared right-of-way for motor vehicles and bicycles
- signed as a bike route



In the short-term, the plan relies on existing staging areas and trail connections to provide access to the Bay Trail. These include existing parking facilities associated with parks and other recreation areas, park-and-ride lots and transit nodes (particularly BART stations, Caltrain stations, and light rail "trolley" stops). As use of the trail increases over time, the Plan proposes that agreements be negotiated which allow trail users limited access to private parking facilities located close to the trail. In the long term, additional staging facilities will have to be developed. The location and the specifics of the future support facilities will require detailed analysis which is not possible at this stage of trail planning.

The alignment is designed to provide trail users access to the large network of parks and other public open spaces which are located near the San Francisco Bay shoreline. Table 3-1 lists many of the parks and open space areas which will be accessible from the Bay Trail. In addition, the Bay boasts many marinas and public boat launches; these can serve as water trail staging points accessible from the trail system.<sup>4</sup> Locations of marina and boat launch facilities are shown in Figure 3-2. The trail alignment also connects with numerous existing and planned city bikeways, which creates additional connections between the trail and urban population and employment centers.

Although the Bay Trail Plan identifies a trail alignment, the regional nature of the plan and the fact that development of specific segments will rely on local implementation means that, realistically, the proposed alignment is largely conceptual in nature. For example, while the trail route follows many streets and will likely be developed as class II bicycle lanes, planning at the project level must determine the safest and most appropriate way to accommodate the constraints of the existing built environment. In some cases, one street may be substituted for another as the preferred trail alignment. For this reason, impacts associated with trail alignments are described as classes of impacts associated with various built and natural environments, rather than specific impacts related to each segment of the trail.

## **2.4 Public Involvement Process**

The scoping period for the Bay Trail Program EIR included substantial citizen involvement in identifying potential impacts, mitigation measures and alternative trail alignments. A three-month period provided ample opportunity for scoping the analysis and incorporating public comments during preparation of the EIR.

Prior to environmental review, public involvement played a pivotal role in developing the trail alignment and draft policies, through the work of the Bay Trail Advisory Committee. The Advisory Committee is comprised of 35 members and their designated alternates, representing a wide range of environmental and conservation organizations, recreation groups, public agencies, park and recreation commissions, and shoreline property owners. Much of the committee's initial work was done in subcommittees. Advisory Committee meetings and meetings of the geographic area committees, trail design, transportation and environmental issue subcommittees were open to participation by all interested citizens. The combined efforts of many helped shape the draft Bay Trail Plan.

Eighteen letters of comment were received in response to the EIR notice of preparation. All relevant issues raised by these letters were included in the impact analysis. The preliminary analysis was subsequently reviewed at a session of the the Bay Trail Advisory Committee's environmental issues subcommittee.

Three impact/mitigation workshops were conducted as public forums for evaluating the trail alignment for its potential environmental impacts. There were three workshops, one in each major subregion of the Bay Area -- the East Bay, North Bay and Peninsula/South Bay. The sessions were designed to give interested persons the opportunity to identify locations of potential significant impacts in each reach of the Bay. Participants studied a series of alignment maps for each subregion and were asked to identify potential impacts by classes and to suggest potential mitigation measures which could be applied to reduce or eliminate each impact. This process included noting alternative alignments if needed. The results of these sessions have helped to focus the impact analysis and have been incorporated into this report.

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<sup>4</sup>The use of ferries, boats and canoes to connect shoreline destinations is one alternative to building trails along shoreline where bay fill would be required to construct a shoreline trail. These "water trails" along designated waterways also provide an attractive bay experience for trail users.

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## 3. Land Use

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### 3.1 Setting

The San Francisco Bay Area is one of the most highly urbanized estuaries in the world. Within the nine counties that surround the San Francisco and San Pablo Bays, 8 counties and 36 cities touch the bayshore. With the exception of the San Pablo Bay, most of the upland areas adjacent to the bayfront have already been developed. In addition, the majority of the 5.8 million people who now live in the San Francisco Bay Area live within five miles of the Bay. The Bay Trail would generally be located within this urban core. Land uses contiguous to the Bay Trail alignment span the range of land uses in the greater Bay Area--from heavy industrial areas to agricultural and open space uses.

It is not the intent of this chapter to analyze the specific land uses along each segment of the proposed trail, but rather to assess the general land use context, with an emphasis on the implications of each land use category for the future development of the trail. This section begins with a review of the myriad agencies which exercise regulatory control over land uses along the Bay.

#### Regulatory Framework

Jurisdiction over use of the San Francisco Bay shoreline is shared by many federal, state and local agencies. A brief description of the functions and relationships of these regulatory and advisory agencies as they affect implementation of the Bay Trail Plan follows.

##### **U.S. Army Corps of Engineers**

The U.S. Army Corps of Engineers governs the discharge of dredging materials or fill of wetlands. It derives its regulatory authority from the Rivers and Harbor Act (RHA) of 1899 and from Section 404 of the Water Pollution and Control Act (FWPCA) of 1972. The RHA requires a Corps permit prior to the construction of any structures in or across navigable waters. All bayshore areas at elevations lower than mean high tide fall under Corps jurisdiction, according to RHA. This includes all historic wetland areas below mean high tide, even if they are now dry. The FWPCA, by contrast, addresses functional wetlands and requires that the Corps issue permits for fill and/or discharge of material into wetlands and navigable bodies of water. Transportation structures are exempted from the Corps' regulatory authority.

##### **U.S. Environmental Protection Agency**

The Environmental Protection Agency (EPA) has veto power over Section 404 permits. In addition, the environmental guidelines followed by the Corps of Engineers in evaluating permit proposals are developed by EPA.

##### **U.S. Fish and Wildlife Service**

A non-regulatory agency, the Fish and Wildlife Service must be consulted on any federal project that involves the modification of any body of water. The Bay Trail would become a federal project if it were to require any federal permits or use federal funds. Fish and Wildlife serves as an advocate for the preservation and restoration of wetlands, and advises the COE on the biological effects of proposed fill or dredging spoils.

##### **California Department of Fish and Game**

As the state custodian of fish and wildlife resources, the Department of Fish Game provides comments and advice to land use permitting agencies. Fish and Game has limited direct permit authority when a proposed project would alter any streambed.

##### **California State Lands Commission**

The State Lands Commission has authority over all tidal and submerged lands and the beds of navigable waters owned by the State. It also retains a "public trust" in those lands which have historically been subject to tidal influence, but which, due to dikes or fill, are now dry. There are instances where the

agency can require a trail easement across such lands to fulfill the public trust interest, as part of negotiating a boundary line agreement (BLA) with the owner of the property in question. A BLA is legal document, drafted to settle the State's interest in these lands.

### **California State Coastal Conservancy**

The Coastal Conservancy's purpose is to implement a program of agricultural protection, wetlands and facilities restoration and resource enhancement in the coastal zone. The Conservancy is a non-regulatory agency that selects projects to support within its program purpose based on the cost-effectiveness and visibility of the project, as well as the significance and benefit of the resource.

### **San Francisco Bay Conservation and Development Commission**

The San Francisco Bay Conservation and Development Commission (BCDC) is one of the primary permitting agencies concerning bayshore land uses along the San Francisco Bay shoreline. It regulates dredging and filling of salt ponds and historic bayland and land use changes within a 100-foot wide strip of land around the Bay's margin. Salt ponds (areas of former salt marshes that have been diked off from the bay and used for commercial salt production) fall within BCDC jurisdiction, and it exercises regulatory authority over "managed wetlands." These consist of all areas which have been diked off from the bay and have been used as duck hunting preserves, game refuges, or for agriculture.<sup>5</sup> Designated managed wetlands in use prior to 1966 fall within BCDC's jurisdiction.

The agency's goals include: 1) maximizing public access to the bay and 2) ensuring that the existing shoreline be reserved for "designated high priority purposes." These priority uses are ports, water-related industry, water-related recreation, airports, wildlife areas and desalinization and power plants. In the project area's complex regulatory framework, one of the policies most relevant to the Bay Trail is BCDC's charge to issue permits for Bayshore development, requiring minimal fill and "maximum feasible public access" to the shoreline.<sup>6</sup> It is also required to provide for water-oriented land use on the shore. These principles are reinforced by the Bay Plan, which enunciates general locations and standards for creating public access and recreational facilities on the bay shoreline.

### **California State Department of Transportation**

The California Department of Transportation (CalTrans) is the state agency authorized to construct and maintain state and federal highways and bridges. CalTrans operates six of the Bay Area's seven major toll bridges, and would play a significant role in determining how the Bay Trail should interface with these facilities, as well as with the Bay Area's highway network.

### **Cities and Counties**

Cities and Counties around the Bay are the principal land use regulatory authorities in the proposed alignment area. They have direct permit control over development projects occurring within their jurisdiction. Among the tools they can use to exercise their powers are zoning ordinance, subdivision control, general plan policies, eminent domain, and park and open space dedications. The Subdivision Map Act states that local agencies "must require public access to ocean coastline or bay shoreline" as part of the approval of either the tentative or final subdivision map of any subdivision fronting on the coast or shoreline."<sup>7</sup> The most applicable local land use policy area for the Bay Trail is that of trail and bikeway master plans, which provide a framework for establishing either a city-wide or county-wide system of trails or bikeways.

### **Special Districts**

Various special districts, which provide a particular public service, have some regulatory authority within the project area if they own and/or manage land on the bayshore. Notable examples are agencies with flood control powers (e.g., Alameda County Flood Control District, Santa Clara Valley Water District) and park and open space districts (e.g., East Bay Regional Park District and Midpeninsula Regional Open Space District).

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<sup>5</sup> McAteer-Petris Act, 1969, amended 1987, California Government Code Title 7.2 section 66610(d).

<sup>6</sup>Ibid., section 66602.

<sup>7</sup>Subdivision Map Act as amended 1987, section 66478.11.



## Land Use Context of the Bay Trail

Land use impacts of the Bay Trail have been evaluated for five categories of land use: residential, open space/agriculture, commercial/industrial, institutional and vacant land. Figure 3-1 illustrates the distribution of land uses which now exist along proposed spine and spur trail segments of the Bay Trail.

The primary existing land uses contiguous to the Bay Trail alignment are residential, commercial and open space/agriculture. The open space/agriculture category, which includes grazing lands, wetlands and waterfront parks, predominate at the northern and southern ends of the trail. This is particularly true in the section of the trail system between Vallejo and Novato in the North Bay, and from Fremont to Palo Alto in the East and South Bay. Residential and commercial uses are concentrated on or near the bay frontage of San Francisco and Marin Counties, on the Peninsula from Menlo Park north, in Alameda County from Hayward north, and in Contra Costa County from El Cerrito to Pinole. The Bay Trail skirts the major bayfront airports of the region (the San Francisco and Oakland International Airports); it passes through port facilities south of the Bay Bridge in both Oakland and San Francisco. Finally, the alignment is adjacent to water-related industry in sections of Richmond and Pinole. The following analysis corresponds to the five land use categories illustrated in Figure 3-1.

**Commercial and Industrial.** Commercial land uses are among the most common activities near the trail alignment. Commercial land uses include office, research and development, storage/warehousing and retail; the primary commercial activities are office and retail. In many instances, light industrial and office uses are interspersed along the trail route, especially in the Palo Alto, Sunnyvale, and San Jose, where the semiconductor and computer industries are prominent. Concentrations of office development along the trail include office parks in Brisbane, Foster City, Mountain View, Fremont and San Rafael. Prime examples of retail commercial activities that support marinas and waterfront development are Ghirardelli Square and Fisherman's Wharf in San Francisco, Jack London Square in Oakland, and the active commercial waterfronts of Emeryville, Benicia, Tiburon and Sausalito.

Industrial land uses represent less than five percent of the total bayfront land use. Almost all of the industrial land uses beside the bay are considered "water-related." As such, they are regulated by the San Francisco Bay Conservation and Development Commission (BCDC) and have zones designated in the agency's San Francisco Bay Plan.<sup>8</sup> According to BCDC, the five major water-related industries located on the Bayshore are: 1) petroleum refining, storage and petrochemicals; 2) chemicals; 3) metal refining and fabrication; 4) food processing; and 5) mineral resource processing.<sup>9</sup> Of these, petroleum refining and storage is the largest water-related industry in the San Francisco Bay. It accounts for 81 percent of the 8,237 acres of developed land dedicated to water-related industry in the San Francisco Bay Plan.<sup>10</sup>

Eleven companies operate refineries, tank farms and storage and blending facilities in the eastern and northern bay between Richmond and Martinez. Chemical and metal refining industries are situated in the northeast bay as well. Two major food production plants are located on the Carquinez Strait. Non-water related industrial uses, like glassworks and tanneries, account for less than nine percent of the total industrial land use and are mainly concentrated in the Benicia Industrial Park. Overall, industrial land uses in the Bay Area have been decreasing relative to commercial and residential uses. One indication that this trend is continuing is the number of ongoing development projects involving the conversion of industrial uses into mixed commercial and housing developments. This conversion is especially true in the East Bay.

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<sup>8</sup>San Francisco Bay Conservation and Development Commission, San Francisco Bay Plan, Amended July 1979.

<sup>9</sup>Thomas Thomas and Richard Carlson, An Analysis of the Economic Demand for Land to Support the Needs of Water-Related Industry Around San Francisco Bay, p. 21.

<sup>10</sup>Ibid.

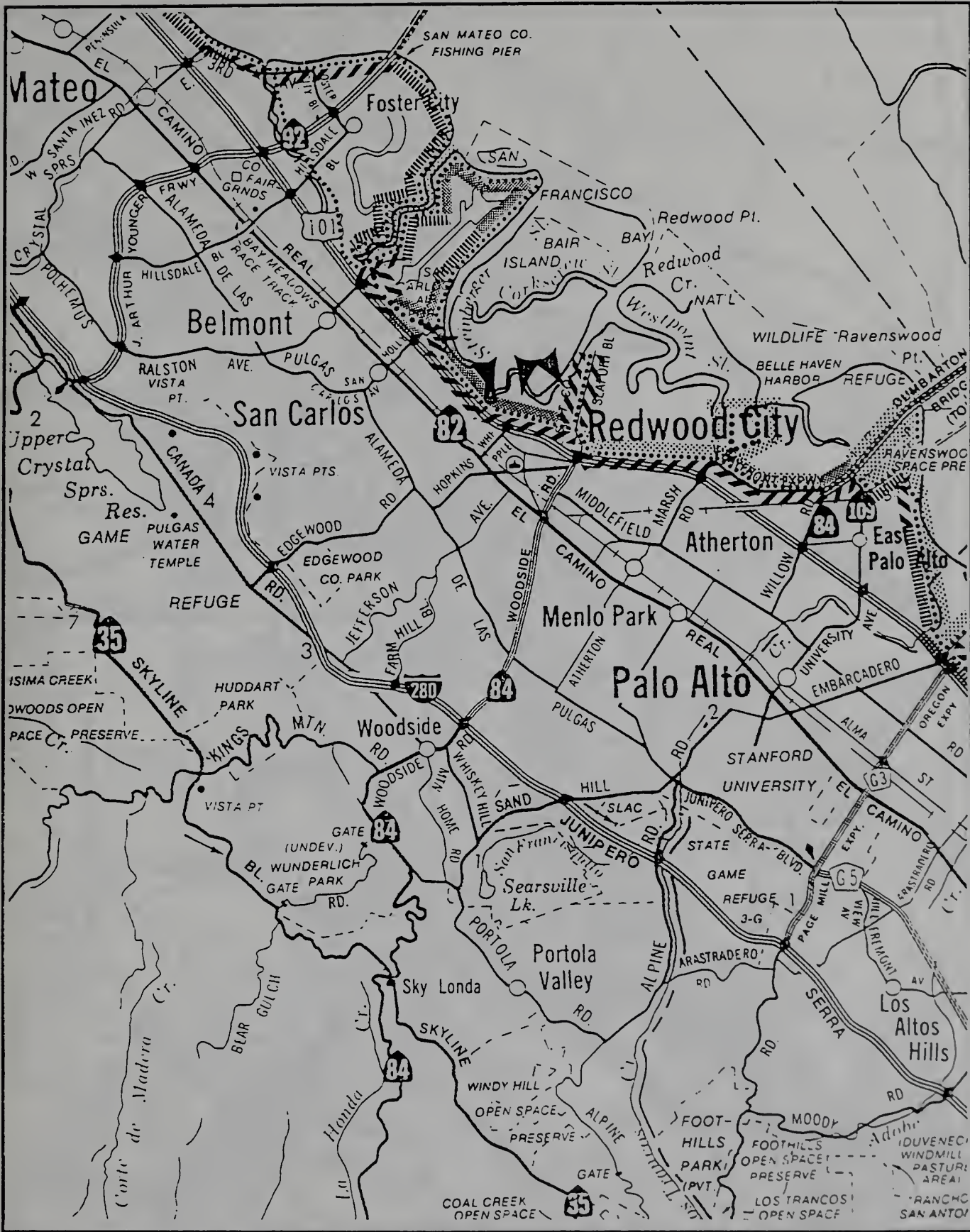


## Existing Land Use

Figure 3-1  
Plate 1

Approx. Scale 0.5 0 1 miles

Map copyrighted 1986 by the California State Automobile Association. Reproduced by permission. OABAG



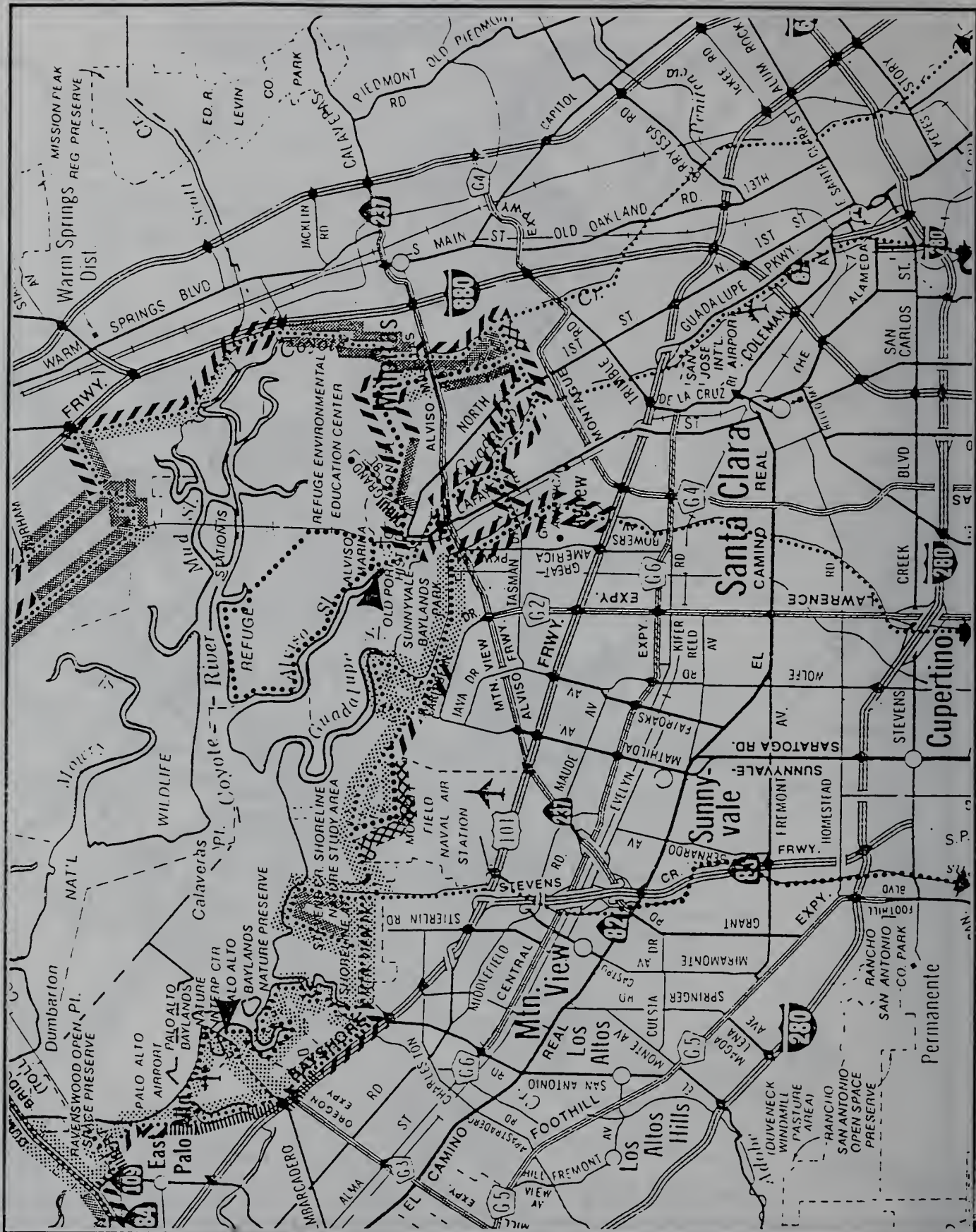
- Trail Alignment (includes connector trails)
- Open Space/Agriculture
- Commercial/Industrial
- Residential
- Institutional
- Vacant
- ▶ Marina/Boat Launch

### Existing Land Use

Figure 3-1  
Plate 2

Approx. Scale miles

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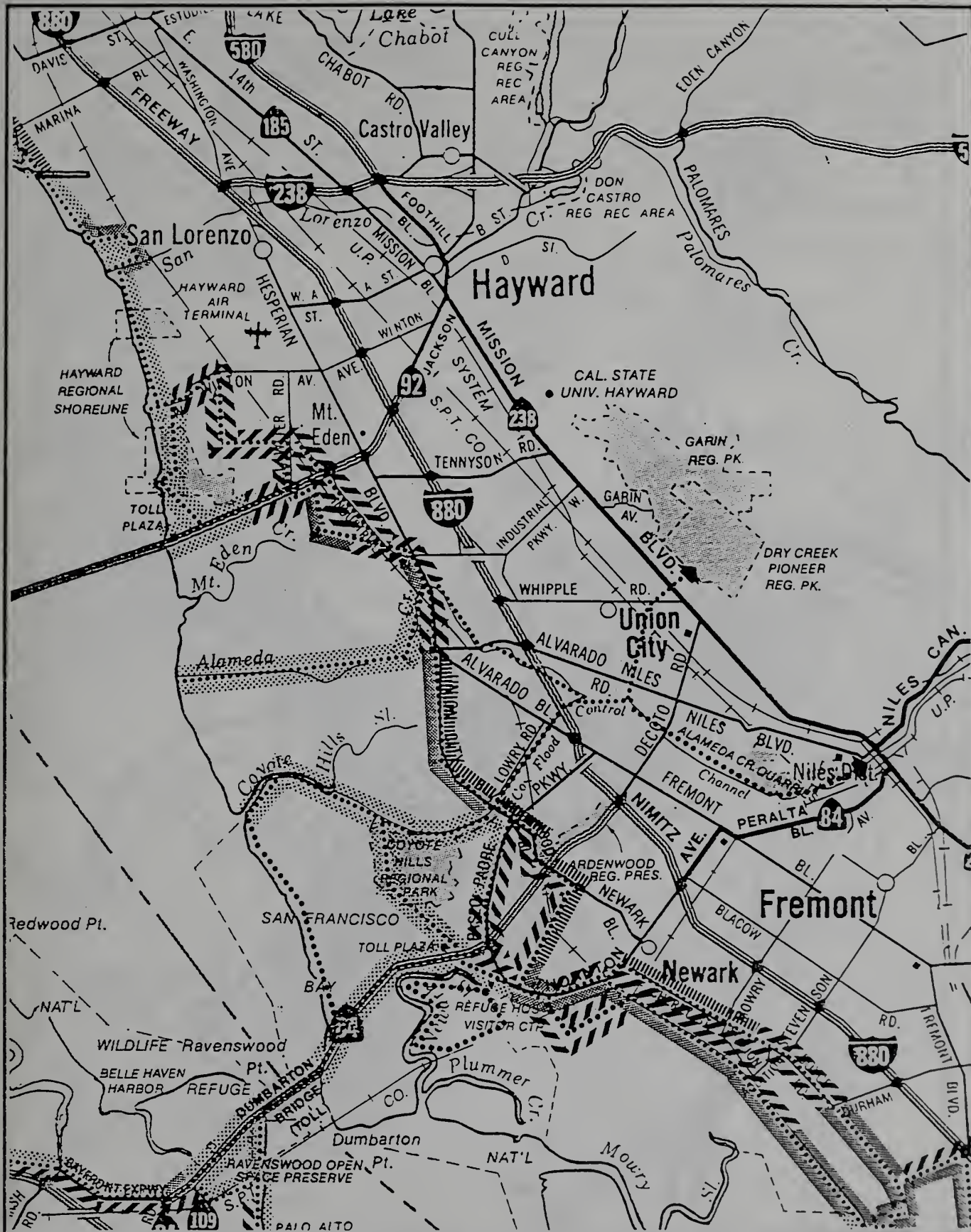
- Trail Alignment (includes connector trails)
- Open Space/Agriculture
- Commercial/Industrial
- Residential
- Institutional
- Vacant
- ▶ Marina/Boat Launch

## Existing Land Use

Figure 3-1  
Plate 3

Approx. Scale miles

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- Trail Alignment (Includes connector trails)
- Open Space/Agriculture
- Commercial/Industrial
- Residential
- Institutional
- Vacant
- Observation Platform
- ▶ Marina/Boat Launch

## Existing Land Use

Figure 3-1  
Plate 4

Approx. Scale 0.5 0 1 miles



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- Trail Alignment (includes connector trails)
- Open Space/Agriculture
- Commercial/Industrial
- Residential
- Institutional
- Vacant
- ▶ Marina/Boat Launch

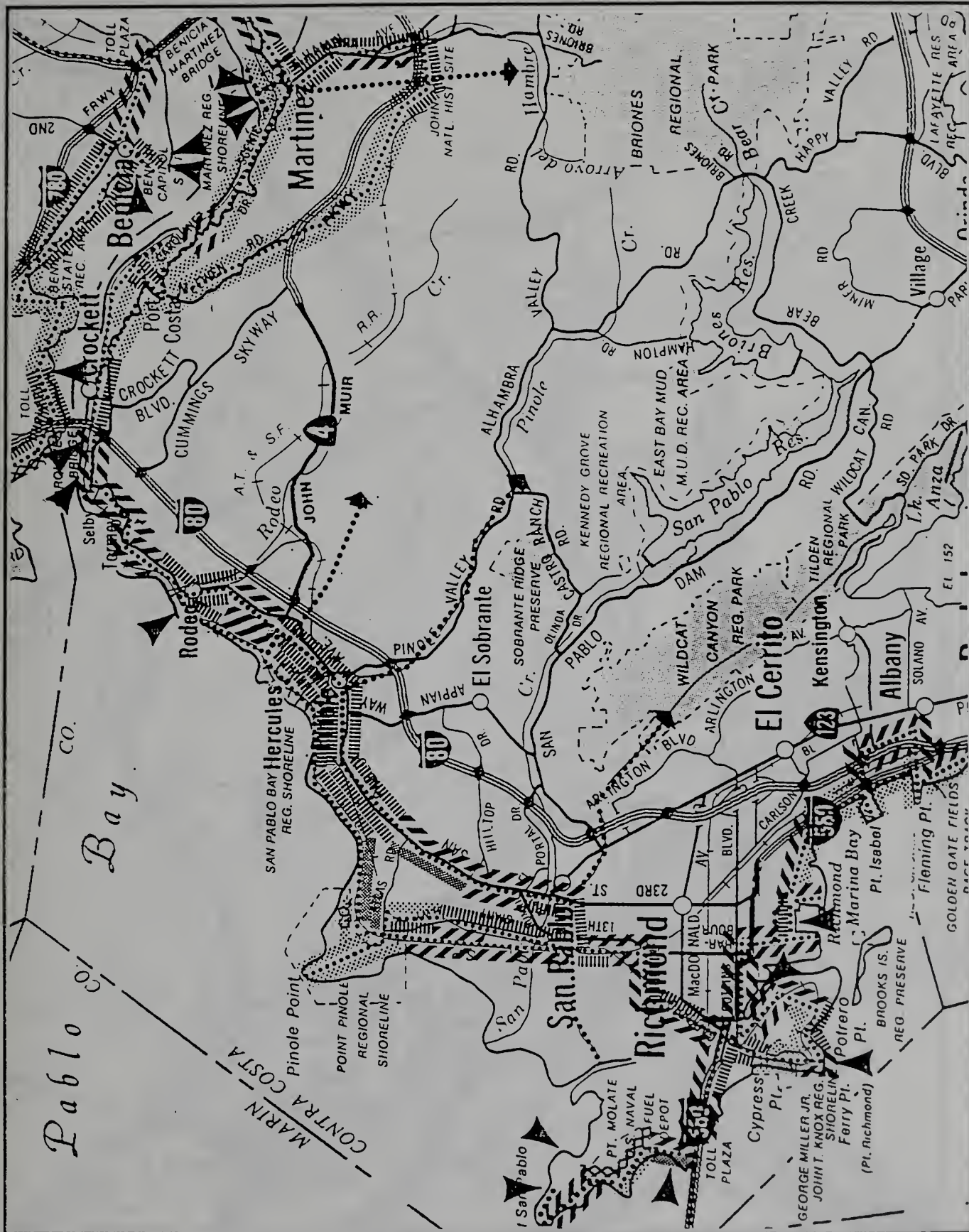
## Existing Land Use

Figure 3-1  
Plate 5

Approx. Scale 0.5 0 1 miles



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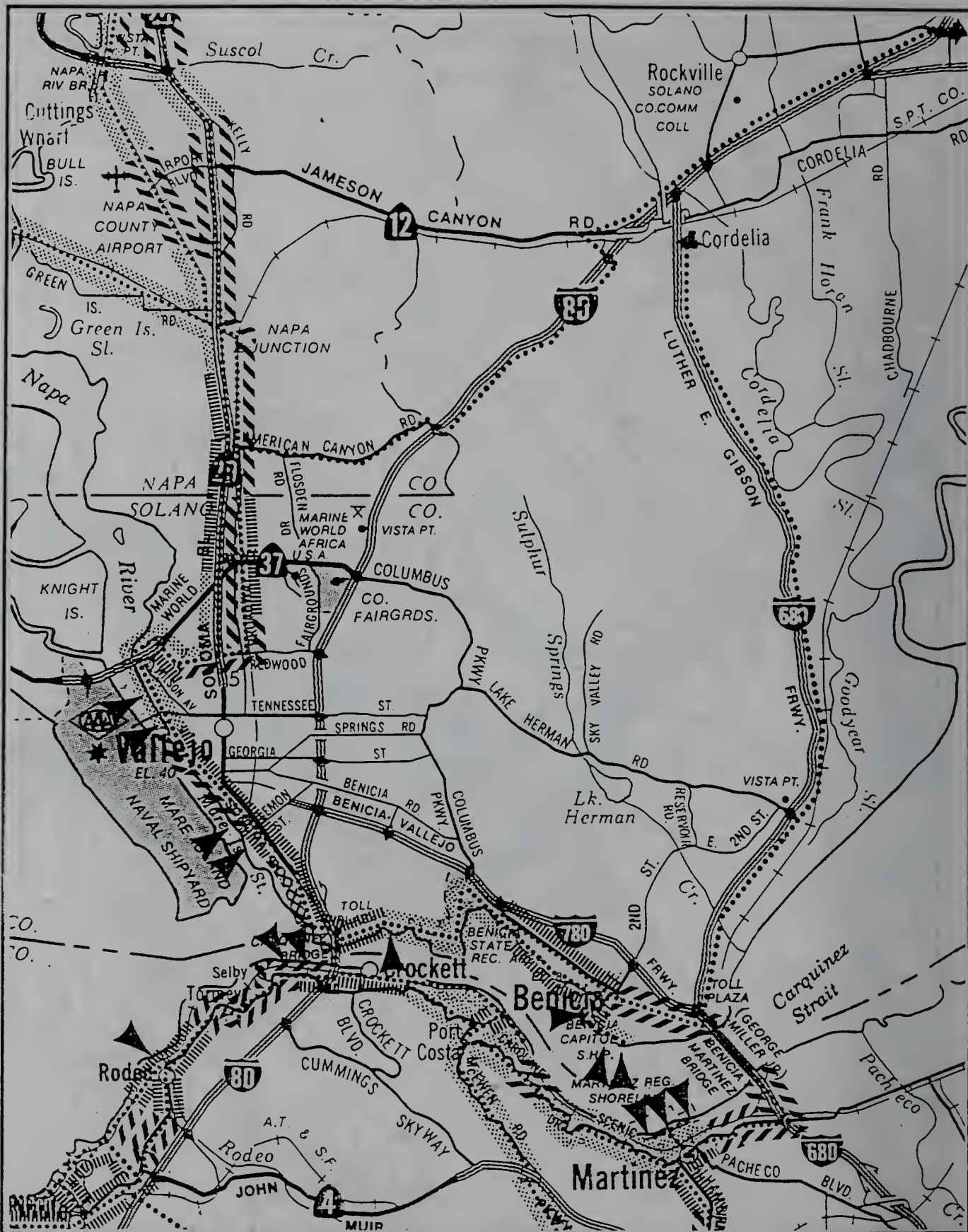
- Trail Alignment (includes connector trails)
- Open Space/Agriculture
- ▨ Commercial/Industrial
- ▤ Residential
- ▥ Institutional
- ▧ Vacant
- ▶ Marina/Boat Launch

## Existing Land Use

Figure 3-1  
Plate 6

Approx. Scale 0.5 0 1 miles

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- Trail Alignment (includes connector trails)
- Open Space/Agriculture
- Commercial/Industrial
- Residential
- Institutional
- Vacant
- Marina/Boat Launch

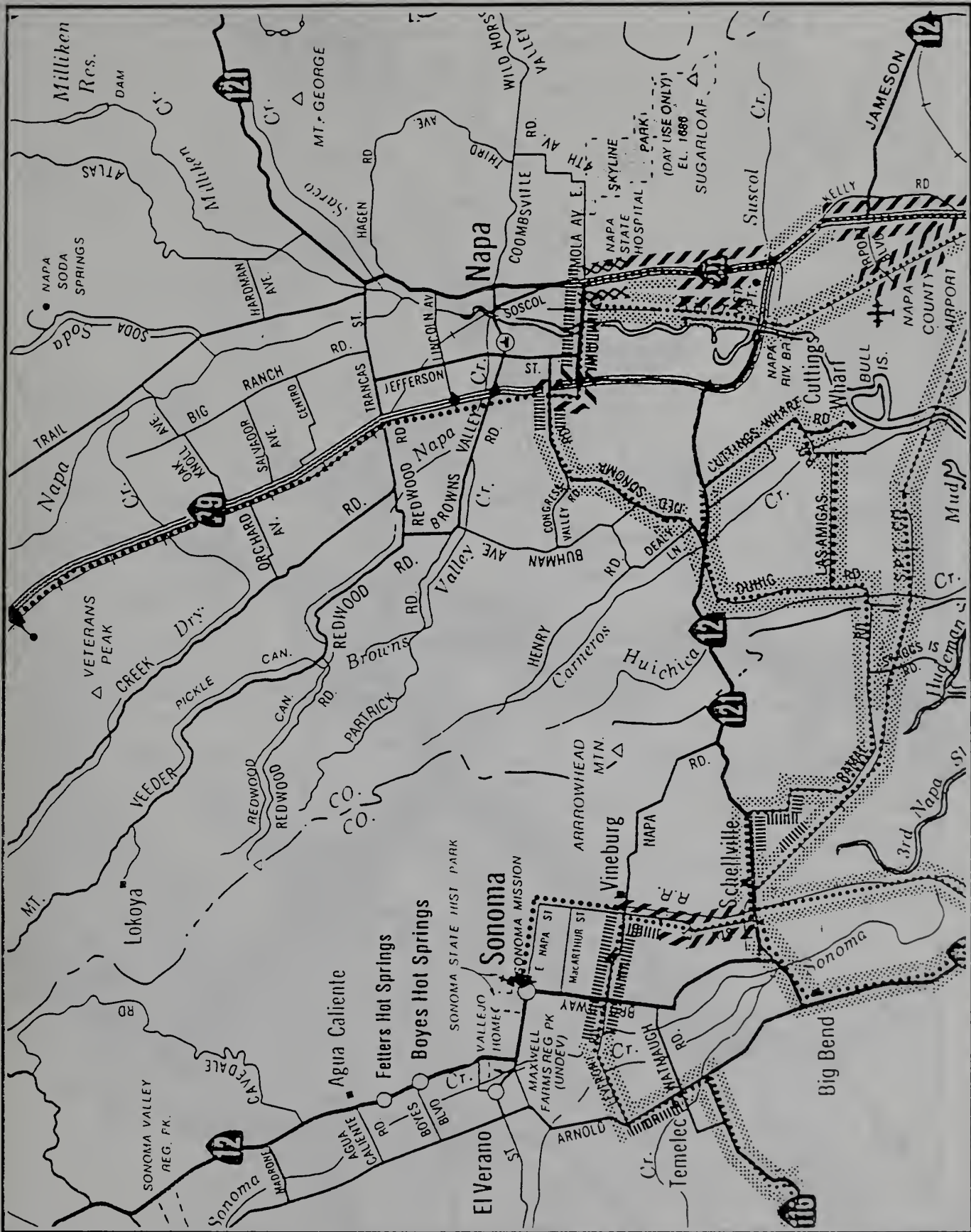
## Existing Land Use

Figure 3-1  
Plate 7

Approx. Scale 0.5 0 1 miles



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- Trail Alignment (includes connector trails)
- Open Space/Agriculture
- Commercial/Industrial
- Residential
- Institutional
- Vacant
- ▶ Marina/Boat Launch

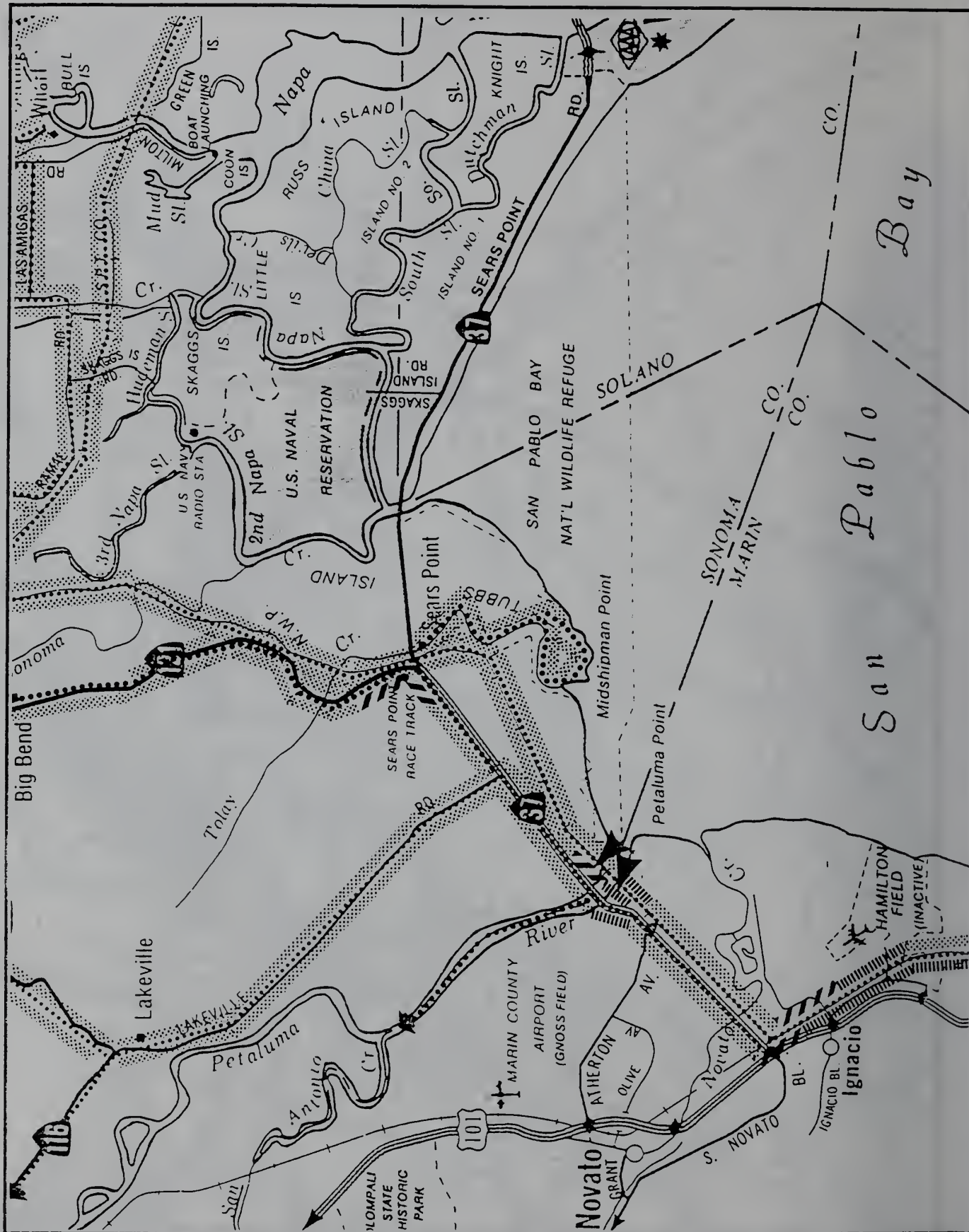
## Existing Land Use

Figure 3-1  
Plate 8

Approx. Scale 0.5 0 1 miles



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- Trail Alignment (includes connector trails)
- Open Space/Agriculture
- ▨ Commercial/Industrial
- ▤ Residential
- ▦ Institutional
- ▧ Vacant
- ▶ Marina/Boat Launch

## Existing Land Use

Figure 3-1  
Plate 9

Approx. Scale miles



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**Residential.** Residential land use along the alignment range from very low intensity rural residential to multifamily development in urban settings. Higher density residential development can be found in the Peninsula/South Bay (San Mateo, Foster City and East Palo Alto) and in the East Bay (Newark, Alameda, and Richmond). Lower-density residential uses are more common in the North Bay segments of the proposed alignment, particularly in and around the cities of Napa, Sonoma, Novato and parts of San Rafael. Medium-density housing predominates in Hercules and Pinole in the East Bay and in Tiburon, Corte Madera and Sausalito in the North Bay. See also Chapter 4, "Housing and Economic Development" for additional discussion of the general residential setting of the Bay Trail.

**Open Space/Agriculture.** This category includes designated open space lands (parkland and protected wetlands), as well as lands in agricultural production. The Bayshore has become a focus for numerous recreation-oriented and conservation activities, including marinas, boat launches, fishing piers, beaches, bayland parks, trails, preserves and observation platforms. Demands for increased recreational opportunities and mounting interest in protecting the Bay's resources have resulted in the acquisition or dedication of over 100 miles of public shoreline over the past 20 years.<sup>11</sup> By comparison, in 1969, only 4 miles of bay shoreline were being used for waterfront parks.<sup>12</sup> The regulatory actions of BCDP have fostered the creation of scores of points of public access along the San Francisco Bay shoreline.

As the connecting feature of a system of shoreline open spaces, the Bay Trail would provide access to more than 90 parks and publicly-accessible open spaces around San Francisco Bay. Table 3-1 illustrates the extent of publicly-accessible open space in each reach of the Bay Trail. Bay Trail spine and spur segments provide connections to 57,370 acres of publicly-accessible open space and recreational facilities throughout the Bay Area: 16,160 acres in the Peninsula/South Bay reach, 11,518 acres in the East Bay reach, and 29,692 acres in the North Bay reach. Connector trails provide access to an additional 7000 acres of recreation and open space facilities. These figures underrepresent the actual amount of publicly-accessible land with which the Bay Trail will connect. Not included in these figures, for example, is much of the BCDP-required public access trail network along the shoreline.

Most of the bayshore parks have a long season, with the highest rate of use observed between April and October. Some of them, particularly those where birdwatching is a primary activity, receive substantial use even during the winter months. Comprehensive, cumulative attendance estimates for these parks are not available. Their popularity is suggested by "peak month" visitation rates recorded in 1985 for three regionally significant public open spaces. In October of that year, the San Francisco Bay National Wildlife Refuge in the South Bay received 20,000 visitors and Benicia State Recreation Area hosted 42,000 users. Candlestick Point State Recreation Area in San Francisco was visited by 9,000 people that April.<sup>13</sup>

Facilities that promote environmental education and awareness of the Bay have generally high attendance as well. In 1986 there were 163,843 visitors to the Coyote Point Museum, Palo Alto Interpretive Center, Hayward Area Recreation District's Marsh Interpretive Center, and the Bay Model in Sausalito. More recent attendance estimates for many of the parks that would connect with the Bay Trail appears in Table 3-2, "Estimated Use Rates for Selected Public Open Space Along the Bay Trail System," drawn from a recreational use survey of park officials conducted by the Bay Trail Project in the spring of 1988.

Other active uses of the Bay's resources include boating, recreational fishing and hunting. The San Francisco Bay's numerous boating facilities provide additional recreational connections to the trail. Some trail users would, in effect, treat marinas and boat launches as staging areas if they were arriving at the trail by boat. There are 80 marinas scattered around the San Francisco Bay that provide homes for 13 fishing ports and 50 yacht clubs. (See Table 3-3, "Boating and Fishing Facilities of the San Francisco and San Pablo Bays," and Figure 3-1.) Two thirds of the Bay's approximately 18,350 boat berths are located in the City of San Francisco, the East Bay shoreline from Alameda to Richmond, and Marin County.<sup>14</sup> Three miles of the Sausalito waterfront and three miles along each side of the Oakland estuary are largely occupied by marinas.

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<sup>11</sup>San Francisco Bay Conservation and Development Commission, 1987 Annual Report.

<sup>12</sup>Bay Plan, p. 21.

<sup>13</sup>National Oceanic and Atmospheric Administration, Marine Environmental Assessment: San Francisco Bay, 1985 Annual Summary.

<sup>14</sup>*Ibid.*, p. 10, as recorded in 1986.

Table 3-1

| Public Lands Accessible from the Proposed Bay Trail<br>Peninsula/South Bay Reach                                                                                                                                                                                 |                  |                    |                         |            |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|-------------------------|------------|---------|
| Facility Name                                                                                                                                                                                                                                                    | City Location    | Agency             | Primary Use             | Access     | Acreage |
| <b>San Francisco City &amp; County</b>                                                                                                                                                                                                                           |                  |                    |                         |            |         |
| Candlestick Point State Rec. Area                                                                                                                                                                                                                                | San Francisco    | State Parks        | Recreation              | Open       | 135     |
| Fort Point National Historic Site                                                                                                                                                                                                                                | San Francisco    | National Parks     | Historic <sup>2</sup>   | Open       | 29      |
| Golden Gate National Rec. Area                                                                                                                                                                                                                                   | San Francisco    | National Parks     | Recreation <sup>2</sup> | Open       | 586     |
| Marina Green                                                                                                                                                                                                                                                     | San Francisco    | City/County        | Recreation              | Open       | 74      |
| Presidio of San Francisco                                                                                                                                                                                                                                        | San Francisco    | Army               | Military                | Open       | 1774    |
| Subtotal                                                                                                                                                                                                                                                         |                  |                    |                         |            | 2598    |
| <b>San Mateo County</b>                                                                                                                                                                                                                                          |                  |                    |                         |            |         |
| Bayfront Park                                                                                                                                                                                                                                                    | Menlo Park       | City               | Recreation <sup>2</sup> | Open       | 160     |
| Bayside Park                                                                                                                                                                                                                                                     | Burlingame       | City               | Recreation              | Open       | 12      |
| Brisbane Lagoon                                                                                                                                                                                                                                                  | Brisbane         | City               | Recreation              | Open       | 122     |
| Coyote Point                                                                                                                                                                                                                                                     | San Mateo        | County             | Recreation              | Open       | 727     |
| Foster City Wildlife Refuge                                                                                                                                                                                                                                      | Foster City      | City               | Recreation              | Open       | 33      |
| Marina Park                                                                                                                                                                                                                                                      | Belmont          | City               | Recreation              | Open       | 22      |
| Orange Memorial Park <sup>c</sup>                                                                                                                                                                                                                                | S. San Francisco | City               | Recreation              | Open       | 30      |
| Ravenswood Baylands                                                                                                                                                                                                                                              | Menlo Park       | MROSD              | Habitat <sup>1</sup>    | Restricted | 372     |
| Redwood City Municipal Marina                                                                                                                                                                                                                                    | Redwood City     | City               | Recreation              | Open       | 20      |
| Redwood Shores Ecolog.                                                                                                                                                                                                                                           | Redwood City     | Ca Fish & Game     | Habitat                 | Open       | 152     |
| San Bruno Mtn Park <sup>c</sup>                                                                                                                                                                                                                                  | San Mateo Co.    | County             | Habitat <sup>1</sup>    | Open       | 2054    |
| San Bruno Mtn. State Park <sup>c</sup>                                                                                                                                                                                                                           | San Mateo Co.    | State Parks        | Recreation              | Open       | 298     |
| SF Bay Nat'l Wildlife Refuge                                                                                                                                                                                                                                     | San Mateo Co.    | US Fish & Wildlife | Habitat                 | Restricted | 4301    |
| Sea Cloud Park                                                                                                                                                                                                                                                   | Foster City      | City               | Recreation              | Open       | 26      |
| Shoreline Park                                                                                                                                                                                                                                                   | San Mateo        | City               | Recreation              | Open       | 41      |
| Tom Fry Golf Course                                                                                                                                                                                                                                              | San Mateo        | City               | Recreation              | Open       | 111     |
| Subtotal                                                                                                                                                                                                                                                         |                  |                    |                         |            | 8481    |
| <b>Santa Clara County</b>                                                                                                                                                                                                                                        |                  |                    |                         |            |         |
| Alviso Marina                                                                                                                                                                                                                                                    | San Jose         | County             | Recreation              | Open       | 29      |
| Coyote Creek Park <sup>c</sup>                                                                                                                                                                                                                                   | San Jose         | County             | Recreation              | Open       | 223     |
| Coyote Creek Park Chain <sup>c</sup>                                                                                                                                                                                                                             | San Jose         | City               | Recreation              | Open       | 399     |
| Los Gatos Creek Park <sup>c</sup>                                                                                                                                                                                                                                | San Jose         | County             | Recreation              | Open       | 30      |
| Palo Alto Baylands Preserve                                                                                                                                                                                                                                      | Palo Alto        | City               | Recreation              | Open       | 2134    |
| Palo Alto Municipal Golf Course                                                                                                                                                                                                                                  | Palo Alto        | City               | Recreation              | Open       | 184     |
| SF Bay Nat'l Wildlife Refuge                                                                                                                                                                                                                                     | Santa Clara Co.  | US Fish & Wildlife | Habitat                 | Restricted | 4301    |
| Shoreline at Mountain View                                                                                                                                                                                                                                       | Mountain View    | City               | Recreation              | Open       | 544     |
| Stevens Creek Nature Study Area                                                                                                                                                                                                                                  | Mountain View    | MROSD              | Habitat <sup>1</sup>    | Open       | 54      |
| Sunnyvale Baylands                                                                                                                                                                                                                                               | Sunnyvale        | City/County        | Recreation              | Open       | 217     |
| Subtotal                                                                                                                                                                                                                                                         |                  |                    |                         |            | 8115    |
| <b>Recreation-related 6157 acres</b> (primary use)<br><b>8637 acres</b> (primary & secondary use)<br><b>Habitat-related: 11,234 acres</b> (primary use)<br><b>12,009 acres</b> (primary & secondary use)<br><b>Other: 1803 acres</b> (primary use)               |                  |                    |                         |            |         |
| Total Peninsula/South Bay Reach acres: 19,194                                                                                                                                                                                                                    |                  |                    |                         |            |         |
| <sup>c</sup> Access from connector trail<br><sup>1</sup> Recreation is a secondary use<br><sup>2</sup> Habitat is a secondary use<br>Source: People for Open Space/Greenbelt Congress. <u>Public Lands Database for the San Francisco Bay Area</u> . March 1988. |                  |                    |                         |            |         |

MROSD: Midpeninsula Regional Open Space District

Table 3-1

| Public Lands Accessible from the Proposed Bay Trail                                                                 |                  |                    |                                               |              |         |
|---------------------------------------------------------------------------------------------------------------------|------------------|--------------------|-----------------------------------------------|--------------|---------|
| East Bay Reach                                                                                                      |                  |                    |                                               |              |         |
| Facility Name                                                                                                       | City Location    | Agency             | Primary Use                                   | Access       | Acreage |
| Alameda County                                                                                                      |                  |                    |                                               |              |         |
| Albany Point                                                                                                        | Albany           | City               | Recreation                                    | Open         | 32      |
| Aquatic Park <sup>c</sup>                                                                                           | Berkeley         | City               | Recreation                                    | Open         | 33      |
| Ardenwood Regional Preserve                                                                                         | Fremont          | EBRPD              | Historic <sup>2</sup>                         | Open         | 208     |
| Casa Verde Park <sup>c</sup>                                                                                        | Union City       | City               | Recreation                                    | Open         | 17      |
| Coyote Hills Regional Park                                                                                          | Fremont          | EBRPD              | Recreation <sup>2</sup>                       | Open         | 966     |
| Crown Beach                                                                                                         | Alameda          | EBRPD              | Recreation <sup>2</sup>                       | Open         | 383     |
| Crown Memorial State Beach                                                                                          | Alameda          | State Parks        | Recreation                                    | Open         | 131     |
| Galbraith Golf Course                                                                                               | Oakland          | City               | Recreation                                    | Open         | 169     |
| Garin Regional Park <sup>c</sup>                                                                                    | Hayward/Union Cy | EBRPD              | Recreation                                    | Open         | 1317    |
| Hayward Regional Shoreline                                                                                          | Hayward          | EBRPD              | Recreation <sup>2</sup>                       | Open         | 817     |
| Hayward Shoreline Interp. Center                                                                                    | Hayward          | HARD               | Recreation <sup>2</sup>                       | Open         | 800     |
| Lakeside Park <sup>c</sup>                                                                                          | Oakland          | City               | Recreation                                    | Open         | 122     |
| Marina Park                                                                                                         | San Leandro      | City               | Recreation                                    | Open         | 30      |
| Municipal Golf Course                                                                                               | Alameda          | City               | Recreation                                    | Open         | 300     |
| North Waterfront Park                                                                                               | Berkeley         | City               | Recreation                                    | Open         | 90      |
| Oyster Bay Regional Shoreline                                                                                       | San Leandro      | EBRPD              | Recreation <sup>2</sup>                       | Open         | 157     |
| SF Bay Nat'l Wildlife Refuge                                                                                        | Fremont          | US Fish & Wildlife | Habitat                                       | Restricted   | 3603    |
| San Leandro Bay Reg'l Shoreline                                                                                     | Oakland          | EBRPD              | Recreation <sup>2</sup>                       | Open         | 663     |
| Sportsfield Park                                                                                                    | Newark           | City               | Recreation                                    | Open         | 26      |
| Washington Park                                                                                                     | Alameda          | City               | Recreation                                    | Open         | 14      |
| Subtotal                                                                                                            |                  |                    |                                               |              | 9878    |
| Contra Costa County                                                                                                 |                  |                    |                                               |              |         |
| Davis Park                                                                                                          | San Pablo        | City               | Recreation                                    | Open         | 16      |
| Carquinez Open Space                                                                                                | Martinez         | City               | Recreation                                    | Open         | 100     |
| Carquinez Strait Reg'l Shoreline                                                                                    | Contra Costa Co. | EBRPD              | Recreation <sup>2</sup>                       | Open         | 147     |
| Miller Knox Regional Shoreline                                                                                      | Richmond         | EBRPD              | Recreation <sup>2</sup>                       | Open         | 259     |
| Martinez Regional Shoreline                                                                                         | Martinez         | EBRPD              | Recreation <sup>2</sup>                       | Open         | 343     |
| Point Isabel Regional Shoreline                                                                                     | Richmond         | EBRPD              | Recreation                                    | Open         | 21      |
| Point Pinole Regional Shoreline                                                                                     | Richmond         | EBRPD              | Recreation <sup>2</sup>                       | Open         | 2147    |
| Rankin Park                                                                                                         | Martinez         | City               | Recreation                                    | Open         | 30      |
| San Pablo Bay Reg'l Park                                                                                            | Pinole/Hercules  | EBRPD              | Habitat                                       | not yet open | 56      |
| Waterfront Park                                                                                                     | Martinez         | City               | Recreation                                    | Open         | 10      |
| Wildcat Canyon <sup>c</sup>                                                                                         | Richmond         | EBRPD              | Recreation                                    | Open         | 2420    |
| Subtotal                                                                                                            |                  |                    |                                               |              | 5549    |
| Recreation-related 11,560 acres (primary use)                                                                       |                  |                    | Total East Bay Reach acres: 15,427            |              |         |
| Habitat-related: 3659 acres (primary use)                                                                           |                  |                    |                                               |              |         |
| 10,549 acres (primary & secondary use)                                                                              |                  |                    |                                               |              |         |
| Other: 208 acres (primary use)                                                                                      |                  |                    |                                               |              |         |
| <sup>c</sup> Access from connector trail                                                                            |                  |                    | EBRPD: East Bay Regional Park District        |              |         |
| <sup>1</sup> Recreation is a secondary use                                                                          |                  |                    | HARD: Hayward Area Recreation & Park District |              |         |
| <sup>2</sup> Habitat is a secondary use                                                                             |                  |                    |                                               |              |         |
| Source: People for Open Space/Greenbelt Congress. Public Lands Database for the San Francisco Bay Area. March 1988. |                  |                    |                                               |              |         |

Table 3-1

| Public Lands Accessible from the Proposed Bay Trail<br>North Bay Reach                                |               |                    |                            |        |         |
|-------------------------------------------------------------------------------------------------------|---------------|--------------------|----------------------------|--------|---------|
| Facility Name                                                                                         | City Location | Agency             | Primary Use                | Access | Acreage |
| <b>Solano County</b>                                                                                  |               |                    |                            |        |         |
| Benicia State Recreation Area                                                                         | Benicia       | GVRPD              | Recreation                 | Open   | 450     |
| Glen Cove Waterfront                                                                                  | Vallejo       | GVRPD              | Recreation                 | Open   | 15      |
| Marina Park                                                                                           | Vallejo       | GVRPD              | Recreation                 | Open   | 12      |
| River Park                                                                                            | Vallejo       | GVRPD              | Flood Control <sup>1</sup> | Open   | 55      |
| Subtotal                                                                                              |               |                    |                            |        | 532     |
| <b>Napa County</b>                                                                                    |               |                    |                            |        |         |
| Kennedy Park <sup>c</sup>                                                                             | Napa          | City               | Recreation                 | Open   | 340     |
| Subtotal                                                                                              |               |                    |                            |        | 340     |
| <b>Sonoma County</b>                                                                                  |               |                    |                            |        |         |
| Petaluma Adobe State Historic Pk <sup>c</sup>                                                         | Petaluma      | State Parks        | Historic <sup>1</sup>      | Open   | 41      |
| San Pablo Bay Nat'l Wildlife Refg.<br>(Lower Tubbs Island)                                            | Sonoma Co.    | US Fish & Wildlife | Habitat <sup>1</sup>       | Open   | 332     |
| Sonoma State Historic Park <sup>c</sup>                                                               | Sonoma        | State Parks        | Historic <sup>1</sup>      | Open   | 64      |
| Subtotal                                                                                              |               |                    |                            |        | 437     |
| <b>Marin County</b>                                                                                   |               |                    |                            |        |         |
| Angel Island State Park                                                                               | Tiburon       | State Parks        | Recreation                 | Open   | 758     |
| Blackie's Pasture                                                                                     | Belvedere     | City               | Recreation                 | Open   | 14      |
| Bothin Marsh Open Space Pres.                                                                         | Mill Valley   | MCOSD              | Recreation <sup>2</sup>    | Open   | 112     |
| China Camp State Park                                                                                 | San Rafael    | State Parks        | Recreation                 | Open   | 1512    |
| Corte Madera Marsh Ecol Pres                                                                          | Corte Madera  | Ca Fish & Game     | Habitat                    | Open   | 621     |
| Dunphy Park                                                                                           | Sausalito     | City               | Recreation                 | Open   | 10      |
| Golden Gate National Rec. Area                                                                        | Marin Co.     | Nat'l Parks        | Recreation <sup>2</sup>    | Open   | 23,155  |
| County Fairgrounds & Civic Center                                                                     | San Rafael    | County             | Recreation                 | Open   | 140     |
| McInnis Park                                                                                          | San Rafael    | County             | Recreation <sup>2</sup>    | Open   | 441     |
| McNears Beach County Park                                                                             | San Rafael    | County             | Recreation                 | Open   | 52      |
| Paradise Beach County Park                                                                            | Tiburon       | County             | Recreation                 | Open   | 19      |
| Pickleweed Park                                                                                       | San Rafael    | County             | Recreation                 | Open   | 25      |
| Piper Park <sup>c</sup>                                                                               | Larkspur      | City               | Recreation                 | Open   | 30      |
| Richardson Bay Park                                                                                   | Tiburon       | City               | Recreation                 | Open   | 55      |
| Richardson Bay Open Space                                                                             | Tiburon       | MCOSD              | Habitat <sup>1</sup>       | Open   | 113     |
| Richardson Bay Wildlife Pres.                                                                         | Tiburon       | Audubon            | Habitat <sup>1</sup>       | Open   | 891     |
| Ring Mountain Open Space Pres.                                                                        | San Rafael    | Sempivirons Fund   | Habitat                    | Open   | 377     |
| San Rafael Bayfront                                                                                   | San Rafael    | MCOSD              | Habitat <sup>1</sup>       | Open   | 121     |
| Strawberry Recreation District                                                                        | Tiburon       | Strawberry Rec.    | Recreation                 | Open   | 48      |
| Tiburon Uplands Nature Preserve                                                                       | Tiburon       | County             | Recreation <sup>2</sup>    | Open   | 24      |
| Subtotal                                                                                              |               |                    |                            |        | 28,518  |
| <b>Recreation-related 27,212 acres</b> (primary use)<br><b>28,829 acres</b> (primary & secondary use) |               |                    |                            |        |         |
| <b>Total North Bay Reach acres: 29,827</b>                                                            |               |                    |                            |        |         |
| <b>Habitat-related: 2455 acres</b> (primary use)<br><b>26,187 acres</b> (primary & secondary use)     |               |                    |                            |        |         |
| <b>Other: 160 acres</b> (primary use)                                                                 |               |                    |                            |        |         |

<sup>c</sup>Access from connector trail<sup>1</sup>Recreation is a secondary use<sup>2</sup>Habitat is a secondary use

GVRPD: Greater Vallejo Recreation &amp; Park District

MCOSD: Marin County Open Space District

Strawberry Rec: Strawberry Recreation District

Source: People for Open Space/Greenbelt Congress. Public Lands Database for the San Francisco Bay Area. March 1988.

### Table 3-2

## Estimated Use Rates for Selected Public Open Spaces Accessible from the Bay Trail System

| Park, Open Space or Trail Facility                                                                                 | Peak Season          | Level of Facility Use (people/day) |           |           |            |       |
|--------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------|-----------|-----------|------------|-------|
|                                                                                                                    |                      | 0 - 100                            | 101 - 250 | 251 - 500 | 501 - 1000 | 1000+ |
| <b>Peninsula/South Bay</b>                                                                                         |                      |                                    |           |           |            |       |
| Bayfront Park & Expressway Path, Menlo Park                                                                        | Summer               | ●                                  |           |           |            |       |
| Baylands Nature Preserve, Palo Alto                                                                                | Fall, Winter, Spring |                                    |           |           |            | ●     |
| Candlestick Point S.R.A., San Francisco                                                                            | Winter               | ●                                  |           |           |            |       |
| Foster City Levee Pedway                                                                                           | warm weekends        |                                    |           | ●         |            |       |
| Los Gatos Creek Trail*                                                                                             | June - September     |                                    |           | ●         |            |       |
| Marina Green & Park, San Francisco                                                                                 | Summer and Fall      |                                    |           |           |            | ●     |
| Redwood Shores Marlin Park Trail, Redwood City                                                                     | N.A.                 | ●                                  |           |           |            |       |
| Redwood Shores Perimeter Trail, Redwood City                                                                       | N.A.                 | ●                                  |           |           |            |       |
| San Francisco Bay National Wildlife Refuge                                                                         | Spring               |                                    |           | ●         |            |       |
| Shoreline at Mountain View                                                                                         | May - September      |                                    |           |           |            | ●     |
| Shoreline Trail, San Mateo                                                                                         | Summer               |                                    |           | ●         |            |       |
| Sierra Point, Brisbane                                                                                             | year round           | ●                                  |           |           |            |       |
| Stevens Creek Nature Shoreline & Ravenswood, MROSD                                                                 | Spring and Fall      | ●                                  |           |           |            |       |
| Note: These figures were derived from a May 1988 survey of Bay Area Park Facilities Managers.<br>* Connector Trail |                      |                                    |           |           |            |       |

### Table 3-2

## Estimated Use Rates for Selected Public Open Spaces Accessible from the Bay Trail System

[illegible]

Table 3-2

## Estimated Use Rates for Selected Public Open Spaces Accessible from the Bay Trail System

| Park, Open Space or Trail Facility                                                            | Peak Season          | Level of Facility Use (people/day) |           |           |            |       |
|-----------------------------------------------------------------------------------------------|----------------------|------------------------------------|-----------|-----------|------------|-------|
|                                                                                               |                      | 0 - 100                            | 101 - 250 | 251 - 500 | 501 - 1000 | 1000+ |
| <b>North Bay</b>                                                                              |                      |                                    |           |           |            |       |
| Benicia State Recreation Area                                                                 | March - October      |                                    |           |           | ●          |       |
| Benicia Waterfront Pathway System                                                             | Spring, Summer, Fall | ●                                  |           |           |            |       |
| China Camp State Park, San Rafael                                                             | April - October      |                                    |           |           | ●          |       |
| Sausalito Multi-use Pathway System                                                            | June - September     |                                    |           |           |            | ●     |
| Note: These figures were derived from a May 1988 survey of Bay Area Park Facilities Managers. |                      |                                    |           |           |            |       |

Table 3-3

| Boating and Fishing Facilities<br>of the San Francisco and San Pablo Bays                                                                                                                                                                          |           |           |               |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|---------------|---------------|
| County                                                                                                                                                                                                                                             | Marinas   |           | Boat Launches | Fishing Piers |
|                                                                                                                                                                                                                                                    | Public    | Private   |               |               |
| Alameda                                                                                                                                                                                                                                            | 15        | 15        | 9             | 5             |
| Contra Costa                                                                                                                                                                                                                                       | 3         | 11        | 6             | 1             |
| Marin                                                                                                                                                                                                                                              | 1         | 15        | 12            | 2             |
| Napa                                                                                                                                                                                                                                               | 0         | 2         | 2             | 2             |
| San Francisco                                                                                                                                                                                                                                      | 4         | 5         | 1             | 1             |
| San Mateo                                                                                                                                                                                                                                          | 4         | 4         | 5             | 1             |
| Santa Clara                                                                                                                                                                                                                                        | 2         | 0         | 1             | 0             |
| Solano                                                                                                                                                                                                                                             | 1         | 4         | 3             | 2             |
| Sonoma                                                                                                                                                                                                                                             | 1         | 2         | 0             | 0             |
| <b>Total</b>                                                                                                                                                                                                                                       | <b>21</b> | <b>59</b> | <b>39</b>     | <b>14</b>     |
| Sources:<br>State of California, Department of Boating and Waterways. <u>Inventory of California Boating Facilities</u> . 1986<br>Bay Planning Coalition. <u>The Saved Bay: A Catalogue of the Protected Areas of the San Francisco Bay</u> . 1987 |           |           |               |               |

Sport fishing on the bay remains a popular year-round activity. It is supported by 43 boat launches and 14 fishing piers.<sup>15</sup> The greatest number of launches (29) are located in the North Bay, while the greatest concentration of fishing piers is in the East Bay. There is relatively little hunting activity permitted in wetlands adjacent to the Bay Trail alignment. Only the San Francisco Bay National Wildlife Refuge allows waterfowl hunting. Hunting occurs on almost all of the sloughs and open waterways within the Refuge, as well as on several salt ponds. Last year about 3000 hunters hunted during the fall season, which customarily lasts from late October to the first week in January.<sup>16</sup>

Large portions of the northern and southern reaches of the trail alignment would pass near areas in either agricultural or salt production. Most of the trail's length in Napa and Sonoma Counties pass by pasture lands and vineyards. The Southern Pacific and Northwestern railroad right-of-way portions of this alignment are largely adjacent to grazing land. In the South Bay, there are 22,000 acres of diked wetlands in salt production along the trail alignment. Over 15,000 acres of the salt evaporation ponds are within the San Francisco Bay National Wildlife Refuge. The area of wetlands composed of salt ponds extends further into the bay with the increasing shallowness of the South Bay. They reach their greatest concentration in the vicinity of the lower Coyote Creek, where the ponds stretch out to three miles from the largely urbanized shore. Salt ponds are traditionally considered a mining activity and are, by far, the largest users of bayfront land. Water is pumped between ponds in the process of extracting salt, which for a given salt pond takes four to five years. Water levels decrease and salinity increases in a salt pond as the production cycle approaches completion. Some of these salt ponds are also used for the production and harvesting of brine shrimp. Only a small proportion of the area in salt ponds would actually be contiguous to the trail. The trail's alignment would come into contact with the South Bay's salt ponds only by way of existing levees, notably in Redwood City, Palo Alto, Mountain View, Sunnyvale, San Jose and Fremont.

**Vacant.** Lands that are identified as "vacant" are currently undeveloped, but are designated for urbanization in local general plans. Significant stretches of vacant lands adjacent to the Bay Trail are in the East Bay cities of Fremont, Newark and San Pablo. These vacant lands are primarily designated for commercial and residential development.

**Institutional.** Comprised of schools, hospitals, military bases, and civic centers, institutional uses are found in small pockets around the alignment. Among the major instances of military uses near the trail are Moffett Field Naval Air Station near Mountain View, Point Molate Naval Fuel Depot in Richmond, and the U.S. Naval Air Station in Alameda. Other prominent institutional uses include the Marin County Civic Center, Napa State Hospital and the Agnew State Hospital in San Jose.

Each of the major land use types might have particular implications for the development of the Bay Trail. These will be examined in the "Impact Analysis" section which follows.

### 3.2 Impact Analysis: Land Use

Development of the trail could pose a number of land use impacts. The significant of these impacts is largely dependent on three factors: 1) the design of the trail; 2) its intensity of use; and 3) the degree to which it is implemented as a class I or II bikeway.

The physical presence of the trail itself should not pose adverse land use impacts nor is it likely to modify significantly adjacent land uses. This is particularly true where the trail is developed as a class II facility. The majority of the land use impacts of the trail would be encountered on the relatively small percentage of trail which is likely to be developed as class I paths and would be associated with increased pedestrian and cyclist activity along the proposed trail route in a given area. The acceptability of increased pedestrian and bicycling activity would depend on the trail's compatibility with existing and proposed land uses.

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<sup>15</sup>Bay Planning Coalition, The Saved Bay: A Catalogue of the Protected Areas of the San Francisco Bay, 1987.

<sup>16</sup>Ben Crabb, Assistant Manager, San Francisco Bay Wildlife Refuge, personal communication, November 21, 1988.

Using compatibility as an index, the Bay Trail would be most compatible with parks and other open space which has been improved for public access. The greatest potential conflict in built environments would occur with industrial and high-security institutional land uses. Impacts on natural environments are evaluated in Chapter 8, "Vegetation and Wildlife." In residential and commercial areas, compatibility would be contingent on the design of the trail in relation to the type of development, and the timing of trail implementation.

The increased cycling and hiking activity would be appropriate in shoreline parks and dedicated open spaces, as it would support current park uses. Negative impacts could occur, however, if trail use were to exceed a park's design capacity; trail congestion could burden restroom and parking facilities and interfere with the park's other recreational uses. In addition, in parks with significant wetland features, conflict may result between trail use and wildlife activity. This category of impact will be addressed in Chapter 8, "Vegetation and Wildlife." Existing hunting activity in the wetlands of the San Francisco Bay Wildlife Refuge could conflict with trail use in some areas, posing a potential safety risk for trail users during hunting season (primarily November through early January).

Where the trail is proposed as a class I trail along railroad rights-of-way, it would generally be compatible with adjacent residential development as a linear park or recreational corridor, provided there is sufficient right of way to create a buffer for the adjacent residences. The timing of the trail's implementation would also determine the degree of its impact on residential land uses. If the trail is planned and developed as a public use dedication (i.e., as a recreational feature integrated into a new subdivision) its effect would be negligible. This will be the case in the southern end of the proposed Bay Farm housing development in the City of Alameda, where Bay Trail segments are currently being planned and implemented. If appropriately integrated and designed, the trail could have largely positive impacts in residential areas. A regional trail could be viewed as an amenity to the local community, increasing residents' recreational opportunities, improving their means and points of access to public open spaces and parks, and enhancing the overall quality of the local environment.

Depending on the proximity of the trail to housing and the effectiveness of visual buffers, concerns may be expressed over potential loss of homeowner privacy, increased neighborhood noise, and crime. Privacy and noise impacts would tend to coincide and would occur whenever the trail users can be seen or heard by residents living beside the trail. Privacy and noise impacts will be further addressed in Chapter 4, "Housing and Economic Development" and Chapter 10, "Noise."

Development of the Bay Trail will not, in and of itself, create an increase in crime. Several studies have been conducted to determine whether there has been an increase in various types of crimes associated with trail users, and/or if trail access aids in the commission of crime.<sup>17</sup>

These surveys have concluded that burglary and vandalism crimes attributable to trail users have been insignificant or non-existent. One such study is the 1987 study of the Burke-Gilman Trail in Seattle. This popular trail, which receives an estimated three quarters of a million users per year along its 12-mile length, is comparable to the Bay Trail in the variety of land uses through which it passes. The trail passes through residential areas, an industrial zone, several neighborhood commercial areas, the University of Washington and links six parks. In the eight years of trail operation, there was an annual average of only two incidents of vandalism or break-ins to the 152 homes immediately adjacent to the trail that *may* have been committed by a trail user. Police officers indicated that homes along the trail did not experience a higher rate of such crimes than other homes in the neighborhood.

In the Bay Area, two urban trail studies conducted by the East Bay Regional Park District surveyed residents living adjacent to regional trails about problems that have arisen since the construction of the trails. Eleven percent of residents living adjacent to the Lafayette-Moraga Trail reported trespassing; 3 percent reported vandalism; and 2 percent indicated that the trail had been used for access or escape in burglaries or thefts. Of the residents adjacent to the Alameda Creek Trail, 3 percent reported trespassing, 7 percent reported vandalism, and 5 percent indicated that the trail had been used for access or escape in

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<sup>17</sup>See East Bay Regional Park District, A Trails Study, October 1978 and Seattle Engineering Department and Office for Planning, Evaluation of the Burke-Gilman Trail's Effect on Property Values and Crime, May 1987.

burglaries or thefts. Other minor increases in problems occasionally cited by residents related primarily to noise and privacy.

On the other hand, 82 percent of Lafayette-Moraga neighbors indicated that they had fewer or the same number of problems in the neighborhood since the completion of the trail, while 77 percent of Alameda Creek Trail respondents reported a diminished or equivalent number of problems.<sup>18</sup> These studies strongly suggest that the mere presence of a trail does not contribute to increased neighborhood crime; the conclusions are reinforced by the lack of increase in reports to local police departments of vandalism and robberies associated with trail users on beach access trails required by the Coastal Commission.<sup>19</sup> Furthermore, in urbanized central Contra Costa County, there has been no significant increase in reported crimes attributable to trail users along the Contra Costa Canal Trail and the Lafayette-Moraga Trail.<sup>20</sup>

Development of trail segments along existing streets and use of existing trail segments are not expected to create any significant increase in crime. The public streets proposed for trail usage have moderately high activity levels; they are not isolated. Increased numbers of trail users which may result when trail segments connect are, by themselves, not expected to have any direct effect on crime rates.

The personal safety of trail users may be compromised if the trail route and activities along the trail are obscured from view. High brush, buildings close to the trail, heavy shadow or blind turns of the trail could be used for concealment. Even if there was no evidence of increased criminal activities in such areas, the trail user's perception of personal vulnerability could undermine the use of the trail segment.

Additional housing-related impacts of the trail, such as the potential effect on property values, are addressed in Chapter 4, "Housing and Economic Development."

Trail compatibility conflicts with commercial and light industrial activity, will depend on the nature of the commercial or light industrial use along the trail. In retail or neighborhood commercial areas, the presence of the trail would likely be regarded as a benefit to local commerce, since it could become an additional source of customers for certain retail activities, particularly convenience stores, cafes, bicycle shops, and restaurants. The trail could also benefit office parks or other employment centers, where workers could use the trail during their lunch hour for walking, jogging or bicycle riding. In light industrial developments with high security requirements, or where hazardous materials are stored on-site, the presence of the trail could pose land use conflicts.

Incompatible or hazardous adjacent land use would also be an issue with certain institutional operations like military bases. Security concerns and the presence of explosive and hazardous materials on the grounds of these facilities could present personal safety challenges for trail development in the immediate vicinity. Moffett Field Naval Air Station near Mountain View is one example of this type of potential conflict. Considerable attention will be needed to determine the degree and location of such hazardous conditions in relation to the trail alignment, as well as to assess the extent of the public safety impacts represented by proximity to such operations.

Some active landfill sites and transfer stations near the proposed alignment could also present safety conflicts. Sanitation truck activity to and from these facilities could endanger pedestrians and bicyclists, where the trail is proposed along through routes used by this traffic. Possible examples of this conflict include Newby Island Landfill in the South Bay and the San Leandro Transfer Station. Heavy industrial areas, including ports and salvage yards adjacent the trail alignment could generate similar safety conflicts, due to the operation of heavy equipment and the high volume of truck traffic entering and exiting these areas. Safety problems associated with traffic will be more thoroughly addressed in Chapter 5, "Traffic and Circulation."

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<sup>18</sup>EBRPD, Trails Study, p. 21.

<sup>19</sup>Tom Mikkelson, Assistant General Manager, EBRPD, personal communication, October 21, 1988.

<sup>20</sup>Lt. Norm La Pera, Operations Lieutenant, EBRPD, personal communication, November 21, 1988; Deputy John Snell, Crime Analyst, Contra Costa County Sheriffs Department, personal communication, November 22, 1988.

The potential for littering and vandalism by cyclists and pedestrians is an impact that could affect all land uses along the trail. While this is not considered a significant anticipated effect overall, it would be more serious in the most heavily used portions of the trail. Littering could pose a hazard to wildlife, particularly the consumption of or tangling with plastic products by birds and mammals.

The trail alignment would be passing through some areas where land uses are changing due to rezoning or redevelopment. Industrial uses may, for example be phased out and replaced by commercial or residential uses, as in San Leandro and Hercules. Emerging development or redevelopment in areas where the trail route is proposed could potentially alter the trail alignment and induce design changes.

**Impacts on Parks, Recreation and Land Use Policies.** Relatively few cities and counties around the bay currently designate a bay shoreline trail in their bikeway/trails master plans or parks and recreation elements. Other cities have policy language supporting the concept of a bayshore trail, but lack any alignment map to implement the policies. The trail can be accommodated by most land use categories that cities are designating for their bayfronts; however, if it is not already addressed in City and County general plans, trail segments in these jurisdictions will be more difficult to implement.

**Impacts on Existing Trail Segments and Facilities.** Of the Bay Trail's 402 mile alignment, 141 miles or about 35 percent of the trail already exists. The increased use of existing trails brought about by the creation of a regional trail network may lead to use exceeding the design capacity of some trails and facilities and increased littering problems. Some sections of paved trail may receive more traffic than existing design (trail width, surface, signing) and local conditions could safely permit.

With increased bicycling and pedestrian activity would come an increase in the level of use at existing parking lots designated staging areas for the trail. Parking at existing park facilities, BDCD public access lots, park and ride lots and BART and Caltrain lots (for trail users reaching the trail by BART or Caltrain) used as staging areas would likely increase, particularly on weekends. Attendant impacts, such as increased littering, are likely to increase as well.

### **3.3 Mitigation Measures: Land Use**

Mitigations suggested are related to classes of impacts for the land use categories discussed above. Specific mitigations should be reviewed at the project design level for appropriateness to the particular situation.

No mitigation measures would be required where the Bay Trail is compatible with existing land uses, notably parks and public open spaces that do not include wetlands. (In parklands that do have wetlands which the Bay Trail would cross on existing fill or structures, mitigation may be required. These measures will be discussed in Chapter 8, "Vegetation and Wildlife.") In order to mitigate potential impacts on hunting activity in the San Francisco Bay National Wildlife Refuge, the trail should generally be routed along existing in-board levees. The zone of permitted hunting should also be reviewed to ensure an appropriate buffer between trail users and hunters and to prevent conflicts between these wetland user groups. In addition, some segments of the trail may be closed during hunting season.

If existing trail segments receive a level of use that exceeds their design capacity, they will require upgrading and redesign, separation of bicyclists and hikers on separate trails, or diversion of through traffic on the regional trail to avoid congestion. Draft Bay Trail policies recommend incremental improvements to staging areas.

To minimize privacy and coincident noise impacts on adjacent residential areas, new class I segments of the Bay Trail should be constructed with an adequate buffer strip. A number of residentially situated trail corridors, including the Burke-Gilman and the Lafayette-Moraga Trails, are developed on 50 to 60-foot easements. Some, like the Washington and Old Dominion Trail, have 100-foot easements. This would translate to a 20-to 45-foot wide buffer zone on either side of a 10-foot wide trail. A buffer area of this width should be adequate to prevent most noise and privacy intrusions. Bay Trail design standards should require an acceptable buffer between new class I segments of the trail and adjacent residential

development. Screen plantings and fencing should also be recommended at the project design stage, wherever appropriate, unless the vegetation itself would increase security problems.

Personal and property security should be designed into new Bay Trail segments, particularly class I trail segments which may be located away from public streets and along the rear or side of existing developments, where visibility to the trail may be limited. Wide buffers and/or use of fencing or thorny plants to keep people on the trail and away from inappropriate property access points, and to discourage unauthorized points of trail access should be considered. Industrial or institutional sites which store hazardous materials outside should install cautionary signing.

In designing specific trail segments, significant obstructions to trail users' view of the trail ahead should be avoided. Exceptions may be made in cases where protection of wildlife from human disturbance necessitates a vegetative screen between the wildlife and trail users; however, even vegetative screens to wildlife could incorporate open wire fencing to keep people out of the vegetation. In the future, where new staging areas are developed, the lighting should be even, and any public buildings should be arranged so that their entries are visible from the street and to police patrol. The draft Bay Trail Plan proposes no new staging areas at this point in the planning program.

In locations where the trail alignment would pass through heavy industrial, port, or institutional land uses which are associated with high volumes of truck traffic, project-level trail plans should be reviewed by a traffic engineer to mitigate conflicts between trail users and truck traffic. Mitigation measures could include reduction of truck speed, installation of rumble strips on blind curves, restriction of truck traffic to local destinations, creation of a class I trail, or realignment of the trail.

The effects of littering should be reduced or eliminated through the following means: 1) trash containers placed at convenient locations; 2) appropriate signage reminding trail users not to litter; and 3) volunteer or contract labor to periodically pick up litter. New areas of congregation (picnic tables, staging areas, benches) should be planned where services are available.

In order for the Bay Trail development to be fully incorporated in the local planning process (especially in areas where land use is in transition), it will be necessary to amend local general plans to incorporate the Bay Trail. This would be an important step to enable the implementation of the trail and should be an ongoing process following the adoption of the final plan for the Bay Trail.

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## 4. Housing and Economic Development

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### 4.1 Setting

The proposed Bay Trail project area lies primarily in the lowlands surrounding the Bay. Historically, the flat baylands were first to be developed because of their proximity to natural harbors, the ease of road and rail construction, and access. Today, the project area is substantially developed, and its continued locational importance spurs development and redevelopment to higher economic use. In this context, the proposed Bay Trail alignment passes by and through residential neighborhoods and commercial waterfronts, among other land uses.

The trail alignment characteristics vary from one location to another, but can generally be categorized as lying between open space baylands and residential or commercial development; paralleling highway, major arterial street, or local collector roads through or adjacent to residential districts; and through commercial/industrial waterfront development areas.

Substantial segments of the Bay's waterfront are developed with commercial and industrial businesses. These waterfront enterprises form an important economic base for the cities in which they are located as job centers for residents. Cities have also recognized the aesthetic value of the shoreline and the need to protect the natural habitats of the shoreline for the ecological health of the Bay as a whole. In order to provide satisfactorily for a multitude of waterfront uses, cities have established detailed land use plans and policies to address the continuing and future uses of the waterfront through their general plan, specific plans, or redevelopment plans. The discussion below by bay subregion provides a description of how the proposed trail alignment relates to existing residential developments and how cities approach economic development of the waterfront while providing for trails and other recreational uses.

**Peninsula and South Bay** The Bay Trail is proposed to lie primarily on the water's edge along the San Francisco Peninsula. In some areas, major residential communities (e.g., Foster City, Redwood Shores, and East Palo Alto) are located immediately adjacent to and inland of the trail.

Brisbane's General Plan establishes goals, policies, and a mix of commercial, industrial, and recreational land use designations for the development of its waterfront. Specifically, one of the City's circulation policies is to "encourage implementation of proposed bicycle network that connects City system with the regional system".<sup>21</sup> The land use plan shows a bicycle/pedestrian path system integrated into the waterfront development. The development at Sierra Point illustrates the integration of commerce and recreation. It is an area of commercial development which has been improved with a marina, fishing pier and a trail along the perimeter of the Point. The Sierra Point trail is proposed to be included in the Bay Trail.

**East Bay** The proposed Bay Trail alignment in the East Bay passes through predominantly commercial and industrial developments, open spaces, and parklands. The trail would pass near residential developments in Newark (east of Jarvis Avenue), Hayward (north of Industrial Way), Pinole, Hercules and Martinez (Carquinez Strait Drive and Marina Vista). The trail would use arterials through mixed use districts in West Oakland and Richmond.

Berkeley amended its general plan in 1986 to provide goals and policies for the development and use of the its waterfront. A specific plan was concurrently adopted to implement the amendment. The waterfront plan creates a mix of commercial and public open spaces. The goals support an "appropriate amount of private development" to generate jobs for local residents and revenues in excess of municipal service costs, and the use of the waterfront "primarily for recreational, open space, and environmental uses..."<sup>22</sup>

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<sup>21</sup>Ironside and Associates Planning Consultants, Brisbane General Plan Report, January 28, 1980, p.19.

<sup>22</sup>City of Berkeley, Berkeley Waterfront Specific Plan, October 7, 1986, p.5.

One of the specific objectives is to "coordinate plans for continuous shoreline public access with the cities of Albany and Emeryville."<sup>23</sup>

**North Bay** In the North Bay, the trail alignment's proximity to housing developments covers all the basic characteristics. The proposed trail alignment passes by a residential development at the north end of Vallejo where it parallels Highway 29. In Benicia the trail is proposed along the major collector, Military East and West which bisects the historic residential center of the town. In Mill Valley, the trail is proposed to utilize local collector streets, Strawberry and Seminary Drives, through the residential community on Strawberry Point.

In the mid-1970's Vallejo established two redevelopment plans for sections of waterfront area. One, the Marina Vista Project Urban Renewal Plan, stated its objective was to "provide for waterfront developments exploiting the commercial, residential and recreational advantages of the shoreline."<sup>24</sup> The implementation of the Renewal Plan has included the development of a 10-foot wide promenade along the waterfront, Mare Island Way, from Florida to Marin Streets. The Bay Trail Plan proposes to include this section in the trail system. The ferry dock for commute service to San Francisco and recreational trips to Angel Island is centrally located in the Renewal area, and there are future plans to expand pedestrian-oriented commerce on the street with the development of a ferry terminal complex with retail spaces.

## **4.2 Impact Analysis: Housing and Economic Development**

Potential impacts of trail development relate more to development of class I sections of trail; much of the Bay Trail is likely to be developed as class II bicycle lanes. Adoption and implementation of the Bay Trail Plan will result in new segments of trail being constructed and/or signed between existing segments. Some of the new segments can be expected to be in close proximity to or go through residential developments and waterfront development areas.

Where new segments of trail are in close proximity to residential developments, there will be new recreational opportunities presented by the trail. As existing segments of the trail are extended and connected to other segments, the recreational experience presented by the trail will be enhanced. The closer the trail is to residents, generally the higher the incidence of their use can be expected.

One study in Seattle, Washington of the popular Burke-Gilman bicycle/pedestrian trail concluded that proximity of the trail to residential development had an overall positive influence on property values.<sup>25</sup> The trail is 12.1 miles long, 8 to 10 feet wide and follows an abandoned railroad right-of-way through residential neighborhoods, an industrial area, several neighborhood commercial districts, the University of Washington and links six parks. There is an average of twenty feet of shrubs and trees to buffer the trail from residences. The trail is used by an estimated three quarters of a million people per year. The report concluded, "Property near but not immediately adjacent to the Burke-Gilman Trail is significantly easier to sell and, according to real estate agents, sells for an average of six percent more as a result of its proximity to the trail...The trail has no significant effect on the selling price of homes immediately adjacent to the trail."<sup>26</sup> Negative factors that neutralized the positive influence of the trail on properties immediately adjacent to the trail were noise from trail users and reduced privacy.

There are some obvious physical similarities between the Burke-Gilman Trail and portions of the proposed Bay Trail. Depending on the overall success of the Bay Trail in being perceived as a safe, aesthetically-pleasing, recreational amenity and a viable alternate route to destinations (particularly job centers), the more likely the Bay Trail would be to have a positive influence on property values in the vicinity.

The study suggests that the noise from trail users and the loss of privacy may be negative impacts on residential developments that could be generated from new class I trail segments with the implementation

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<sup>23</sup>Ibid.

<sup>24</sup>City of Vallejo, Urban Renewal Plan As Amended, for Marina Vista Project, California R-14, Vallejo, California, May 5, 1975, p.2.

<sup>25</sup>Seattle Engineering Department.

<sup>26</sup>Ibid., p.2.

of the Bay Trail Plan. The level of impact would vary with the context of the land use setting, building construction and architectural features. Noise and privacy impacts would be most noticeable in areas where the trail approaches a residential development in an open space area where few people currently pass and the ambient noise level is low. Conversely, where the trail uses urban streets, the increased utilization may be imperceptible to local residents.

The availability of the Bay Trail may result in a higher incidence of people walking or bicycling along the trail rather than driving a vehicle to local destinations. This includes use of the trail as a commute route. Such use could incrementally lessen traffic congestion, fossil fuel consumption and air pollution; however, the benefits may be outweighed by new regional trail users who will drive in private vehicles to use the trail.

Where development of new trail segments results in a class I or II bicycle trail, greater safety from vehicle conflict and accidents would be afforded bicyclists than current use of roadways without spatial or physical separation from vehicular traffic.

The trail, under certain circumstances, could have the potential to create access for persons to commit property and personal crimes in residential or commercial/industrial areas. A full discussion of these hazards and mitigation measures is discussed in the Chapter 3, "Land Use."

Because the Bay Trail Plan will publicize the location of existing trail segments, it can be expected that incrementally more people will use existing segments of the trail in the short term. In the long term, trail use will increase as segments of the trail are developed and the recreational value of the trail increases. The primary mode of travel to the trail is expected to be by private vehicle. The Bay Trail Plan and subsequent development of new trail segments can be expected to create an increasing demand for parking, especially during peak use periods on weekends and in the summer months.

There is a potential for trail users to park in residential neighborhoods and commercial/industrial areas where they can get ready access to the trail. In the worst case scenario, trail users' parking could exceed local street parking capacities and give impetus to illegal parking and friction between trail users and local residents/businesses. Introduced access to residential and commercial/industrial areas raises the potential for security problems, as discussed in the Chapter 3, "Land Use."

Commercial services catering to trail users' needs and interests may locate in retail areas adjacent to the trail. Such businesses could add diversity and vitality to commerce along the waterfront. In general, the Bay Trail Plan would be consistent with local jurisdictions' waterfront development goals and policies.

#### **4.3 Mitigation Measures: Housing and Economic Development**

Noise and loss of privacy impacts can be mitigated through project level design. Both impacts are largely a function of the trail's proximity to development. Noise levels may be modified and privacy maximized through the use of physical barriers, either fencing, landscaping, or use of natural topographic features, and by locating the trail as far away as feasible within the right-of-way from sensitive noise receptors and residential areas.

Traffic and parking mitigations are discussed in Chapter 5, "Traffic and Circulation."

Security mitigations are discussed in Chapter 3, "Land Use."



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## 5. Traffic and Circulation

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### 5.1 Setting

The Bay Trail is proposed to be developed in a highly urbanized area with a full array of transportation systems and infrastructure. While the trail is not proposed for any motorized recreational vehicle use, it will, in places, use the road system, interface with vehicle traffic, and depend on motorized forms of transportation for access to the trail.

The Bay Area has an estimated 1988 population of 5.8 million people, and the predominate mode of transportation is the private vehicle.<sup>27</sup> There are approximately four motor vehicles for every five people, according to the registration records of the Department of Motor Vehicles.<sup>28</sup> The major highways that circumscribe San Francisco and San Pablo Bays are Interstates 80, 580, 680, 780, 880, and State Highways 37, 84, 92, 101, and 237. Portions of the proposed Bay Trail would closely parallel or cross all of them.

In addition to the Trail's close proximity to highways and planned transportation corridors, portions of the trail would use existing public streets. The roadways can be classified in terms of their vehicle capacity as arterials, collectors and local streets. The roadways provide passage through every type of land use and the vehicles using the roadways often reflect the land use (e.g., heavy trucks in an industrial area, a predominance of cars in a residential neighborhood).

The Bay Trail would parallel segments of railroad lines throughout the plan area. Some lines have been abandoned, such as the section between Larkspur and Novato which is proposed for reuse as a high capacity transit corridor; the Southern Pacific "peninsula rail corridor is a candidate for sale", but many branches are active lines with no foreseeable abandonment.<sup>29</sup>

While trails next to active railroad lines are not common, there are a number of such trails in the United States, particularly in the midwest (e.g., Green Bay Trail in Wilmette, Illinois; Southwest Corridor Park in Boston, Massachusetts; Heritage Trail in Dubuque, Iowa). The Traction Line Bikeway in Morris County, New Jersey, is a class I trail which parallels a commuter rail line. The trail is located at points as close to ten feet to the rails, but is separated from the trail operations by an eight foot chain link fence which is discontinuous at cross streets. There are 42 trains scheduled on weekdays and 12 on weekends. Since the trail's construction in 1986, no conflicts between trail users and the trains have resulted in injuries.<sup>30</sup>

The larger Bay Trail vicinity is served by seven vehicle toll bridges and several ferry routes. The Bay Trail Plan proposes pedestrian and bicycle access across all of the bridges. Only two bridges, the Golden Gate and Dumbarton, currently have bicycle and pedestrian access in the form of class I trails. The California Department of Transportation (CalTrans) currently offers bicycle shuttle service across the other five bridges; access to this service requires that arrangements be made 24 hours in advance. No comparable service is offered to pedestrians. CalTrans has recently released a report that discusses the existing levels of access on Bay Area toll bridges, alternative methods for improving access, and recommendations as to which approaches appear to be most effective and feasible.<sup>31</sup>

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<sup>27</sup>California Dept. of Motor Vehicles, "Total Vehicles Currently Registered as of 30 September 1988."

<sup>28</sup>Ibid.

<sup>29</sup>Robert W. Taggart, Vice-President, Southern Pacific Transportation Company, letter of November 7, 1988.

<sup>30</sup>William Feldman, Bicycle Advocate, New Jersey Department of Transportation, letter of September 1, 1988.

<sup>31</sup>California Department of Transportation, District 4, A Study Report for Bicycle Access on Bay Area Toll Bridges, January 1988.

One short ferry route is proposed as part of the Bay Trail system; this is the ferry connection between Tiburon and Angel Island. In addition, the trail would connect with commercial ferry terminals at Vallejo, San Francisco, and Sausalito although ferry transit from these points is not part of the Plan.

Public transit in the greater Bay Trail vicinity is provided by a number of transit agencies. San Francisco Municipal Railway (Muni) serves the City and County of San Francisco. Caltrain provides rail service and SamTrans provides bus service on the San Francisco peninsula. Santa Clara County Transit serves the trail area in Sunnyvale, Palo Alto, Mountain View, Santa Clara and San Jose by county-wide bus routes and a light rail "trolley" system in San Jose and Santa Clara. Alameda-Contra Costa Transit District (AC) and BART serve the East Bay trail area from Fremont northward. Central Contra Costa Transit Authority services the trail vicinity in Martinez and Benicia. The Golden Gate Bridge, Highway and Transportation District serves Marin and Sonoma County in the north bay. There is a substantial area of Napa and Solano Counties that does not have any public transit service.

In reviewing existing public transit service within the vicinity of the Bay Trail, the level and availability of service was found to be highly variable from one area to another. In areas of San Mateo County, such as Foster City, Redwood City, and Menlo Park, trail areas are not served on Sundays. Many bus routes do not come within even one mile of the proposed trail alignment. Frequency of schedules vary with the lowest being 60 minute headways.

The level of transit service provided by a transit agency is related to the agency's goals and objectives, and the availability of funding. The agency's policies generally define the service area and ideal operations. For example, Muni's long range goals are "to respond to the needs of all transit users...to provide a convenient and effective alternative to the automobile."<sup>32</sup> AC Transit's objective is to provide minimum frequency standards based on demand, population density and type of service.<sup>33</sup> Golden Gate Transit's primary goal is to ensure reasonable mobility across the Golden Gate Bridge.<sup>34</sup>

Fiscal constraints limit transit services. Capital improvements may be funded by federal or state sources, but daily operation funding sources and amounts vary considerably. Muni receives a portion of the City of San Francisco's general funds for its operations, and is subject to budget cutbacks whenever city revenues are reduced. BART, created by a General Obligation Bond Referendum in 1962, has a portion of California toll bridge revenue and sales tax revenue, in addition to the bond revenue. Golden Gate Transit is a special district authorized by California State law and dependent on bridge tolls and transit fares for its operating revenue.

**Peninsula and South Bay** Almost fifty percent of the total Bay Area population resides in this portion of the Bay. Interestingly, this region has the fewest number of registered vehicles in proportion to population, mainly due to the relatively low percentage of vehicle ownership in the City of San Francisco.

The Bay Trail alignment is proposed to pass in San Francisco along the class I bicycle route in the Golden Gate National Recreation Area, along the commercial and industrial Embarcadero, past the ferry terminal with routes to Vallejo, Tiburon and Sausalito, though a solid industrial area between China Basin and Hunter's Point, which is served by rail and heavy trucks. The trail would cross Highway 101 which runs the length of the peninsula, and comes in proximity to Caltrain stops in San Francisco (Fourth and Townsend Streets, and at Tunnel Avenue near Visitacion Avenue) and in Millbrae (Millbrae and California Drive). Caltrain provides service between San Francisco and San Jose; an extension to Gilroy is now being studied. The trail would parallel the railroad line in South San Francisco, San Bruno, and Millbrae. Between Burlingame and San Bruno, the railroad is a high speed operating corridor. South of Millbrae, the trail uses a combination of existing and planned class I pathways and local streets to follow the Bay's shoreline along the peninsula. In San Jose, the trail would use a mix of street types and use levees along creeks and salt evaporation ponds. The preferred alignment lies north of State Route 237; it is proposed

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<sup>32</sup>California Public Utility Commission, San Francisco Municipal Railway Short-Range Transit Plan 1988-1993, August 1988, p. 1.

<sup>33</sup>Alameda-Contra Costa Transit Research and Planning Dept., Alameda-Contra Costa Transit Five Year Plan 1987-1991, June 25, 1986, p. iii-3.

<sup>34</sup>Golden Gate Bridge, Highway, and Transportation District, Golden Gate Bridge, Highway and Transportation District--the Five Year Transit Development Plan, Fiscal Years 1987/88 to 1991/92, p. 29.

to cross Route 237 at Guadalupe River and Coyote Creek to provide connector trails south of the Bay. CalTrans has plans to upgrade State Route 237 from expressway (with signalized stops) to freeway status and to make interchange improvements at Highway 85, Central Expressway, and Highway 101 connections.

Four toll bridges extend from the Peninsula/South Bay reach. Both the Golden Gate Bridge, which connects San Francisco with Marin County in the North Bay, and the Dumbarton Bridge, the peninsula's most southerly connection to the East Bay between Menlo Park and Fremont, already have class I pedestrian and bicycle access.

The San Francisco-Oakland Bay Bridge does not have class I pedestrian or bicycle access; however, BART, which also connects San Francisco and Oakland as well as other East Bay points, allows bicycles during non-commute hours. CalTrans operates scheduled bicycle van shuttle service across the bridge during the commute period. It is notable that the only other transit agency in the Bay Area that currently allows bicycles is the Santa Clara County light rail "trolley" system, which serves the San Jose and Santa Clara.

The San Mateo-Hayward Bridge connects the mid-peninsula with Alameda County at the cities of San Mateo and Hayward. The bridge does not have bicycle or pedestrian access, except for the 24-hour call-in-advance bicycle shuttle service offered by CalTrans.

**East Bay** The East Bay shoreline is the longest of the three regions, covering the area from the Alameda-Santa Clara County line to the Carquinez Strait. The principal freeways are I-880 and I-80. CalTrans is currently conducting the Route 61 corridor study, which could result in a roadway from the Alameda-Santa Clara County line northwesterly to the vicinity of the Oakland International Airport. The study is attempting to locate a feasible alignment between the Southern Pacific Railroad line and wetlands to the west.<sup>35</sup>

Portions of the trail would parallel railroad lines in Fremont, Newark, Oakland, Richmond, and Benicia, and along the shoreline between Richmond and Rodeo. All of these railroad lines are in active use, and there are no plans for abandonment. The trail would use trails and levees through bayland open spaces and parks, and skirt much of the developed area on existing roadways.

There are several points where the trail would cross or parallel paths of heavy truck traffic in industrial areas. The trail is proposed along Doolittle Drive in Oakland and crosses Davis Street where there is a consistent truck traffic to salvage yards and a refuse transfer station. West of Martinez is the Ozol Terminal, a fuel storage and transfer facility for the Department of Defense, which gains access from Carquinez Scenic Drive. The drive is a narrow, winding road proposed to be part of the Bay Trail. It is frequently traveled by truck-trailer or tractor-trailer rigs carrying fuel from the terminal. A recent environmental impact report evaluating the roadway for trail usage has a number of project proposals and report recommendation to reduce the potential conflict between trail users and vehicles.<sup>36</sup> They include closing the road to through traffic, limiting traffic to only those with destinations along the road, lowering the speed limit, and signing the road with a caution to trail users to be alert to approaching vehicles.

In addition to the three bridges that connect the East Bay to the San Francisco peninsula, there are three bridges that connect the East Bay to the North Bay. The bridges are the Richmond-San Rafael Bridge between Contra Costa and Marin Counties; the Carquinez Bridge between Crockett in Contra Costa County and Vallejo in Solano County; and the Benicia-Martinez Bridge which also connects the counties of Solano and Contra Costa. None of the three bridges currently has pedestrian or bicycle access.

The Richmond-San Rafael Bridge has had two bicycle shuttle services since the 1970's, but both were discontinued for lack of use. Presently, CalTrans offers the 24-hour call-in-advance bicycle shuttle service.

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<sup>35</sup>Bruce Couchman, Associate Transportation Planner, California Dept. of Transportation, personal communication, November 12, 1988.

<sup>36</sup>EIP Associates, Carquinez Shoreline Trail and Staging Area Draft Environmental Impact Report, prepared for the East Bay Regional Park District.

The Carquinez Bridge is actually two spans, one built in 1927 and the other in 1958. Because of the rapid development of housing in Solano County and job centers being located in the East Bay and San Francisco, CalTrans has identified an increasing need to construct a replacement bridge of greater capacity than the two existing spans. In the event that a new bridge is built, state law requires that bicycle and pedestrian access be considered. In the interim, CalTrans offers 24-hour call-in-advance bicycle shuttle service.

CalTrans is moving forward with plans to widen the Benicia- Martinez Bridge and has proposed to construct a second span to meet the transportation demands of Solano County. Regularly scheduled bicycle and pedestrian shuttle service will be provided across the Benicia-Martinez Bridge as part of the widening project, and the feasibility of providing pedestrian and bicycle access will be studied in environmental review and design studies for the new span.<sup>37</sup> The 24-hour call-in-advance bicycle shuttle is presently available.

**North Bay** The North Bay is the least populated reach of the plan area with less than a million residents. The development is concentrated just north of the Carquinez Strait in the cities of Benicia and Vallejo and along the Highway 101 corridor near the Bay's edge in Marin County. Between the two urbanized areas are expanses of open space, agriculture, grazing lands, rural residential development, and the Cities of Napa and Sonoma. Like the other reaches of the project area, the Bay Trail would utilize a variety of public roadways through various built environments in the developed areas. Between the developed area of Marin and Solano Counties, the trail would primarily parallel highways, roadways and railroad lines.

CalTrans data indicates that lengthy segments of North Bay highways do not have sufficient width to include a four-foot wide class III bicycle route along the existing shoulder. Such segments include Highway 29 from its intersection with Highway 37 in Vallejo northward to its conjunction with Highway 221, then northward along Highway 221 to Imola Avenue in Napa; Highway 121 from the Sonoma-Napa County line to its junction with Highway 37 at Sears Point; and Highway 116 from its junction with Highway 121 westward to Lakeville Road.<sup>38</sup>

In the North Bay, all of the railroad lines that the trail would parallel are active lines, except for the segment south of the intersection of Highways 37 and 101 in Novato, which has been abandoned. Marin County, the County Transit District, and Golden Gate Bridge Highway and Transportation District have been jointly negotiating a joint purchase of the abandoned section between Novato and Larkspur. Reuse of the right-of-way would either be for a two-track light rail system or a two-lane high occupancy vehicle roadway.

## 5.2 Impact Analysis: Traffic and Circulation

The fact that portions of the Bay Trail already exist and would be within close proximity to millions of Bay Area residents could reflect in the intensity of traffic and circulation impacts in both the short and long term. In the short term, adoption and distribution of the Bay Trail Plan is unlikely to result in any significant increase in use of existing trail segments. As the Plan is implemented and connecting sections of trail are constructed, the recreational value of the trail segments would be enhanced and increased numbers of users can be expected to be attracted to the Bay Trail. Use of connector trails to other trail systems may also experience an increase in use. The trail may also serve non-recreational purposes as a viable mode of access between homes, shopping areas, and job centers. Despite the use of the trail for local destinations, the overall increasing use of the trail could intensify many of the potential traffic and circulation impacts.

Residents who do not live within easy walking or bicycling distance of the trail can be expected most frequently to drive private vehicles to trail access points. Region-wide use of mass transit to reach the trail may be quite low due to a lack of transit in the region, infrequent scheduling, distance of the transit stop to

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<sup>37</sup>Burch C. Bachtold, District Director, California Dept. of Transportation, letter of November 28, 1988.

<sup>38</sup>Ibid.

the trail, and/or the inability of transit facilities to accommodate bicycles. Transit use patterns will vary considerable around the region, due to the diversity of transit service.

As the trail develops, the impact of additional vehicles on highways and roadways to the trail may become noticeable on peak summer weekends in the vicinity of trail staging points. The staging points are likely to be regional parks which have recreational facilities, services, and ample parking. The Bay Trail Plan does not propose the construction of any new parking facilities for trail users. In the long term, if the Bay Trail proved extremely popular, the number of trail users gaining access to the trail through a highly-utilized park could exceed the park's parking and circulation capacity. Such a situation could result in off-site overflow parking, illegal parking, traffic congestion on the streets and highways if the highway is in close proximity to the park.

Some trail users may be inclined to park their vehicle on whatever street comes closest to the trail and walk to the trail without the benefit of a designated path. Such random access would not create any significant circulation problems if occurrences were infrequent; however, if a street became a locally known staging point, it could create a parking impacted neighborhood, increased opportunity for crime, and soil erosion in the area where access is gained.

Construction of the trail could involve grading and paving for new class I trails and shoulder widening for a bike lane or route, restriping streets, and loss of curb parking for a bike lane. Grading presents the potential for soil erosion and sedimentation. This is discussed in Chapter 6, "Geology and Soils." Trail construction may temporarily divert and slow vehicle traffic. Loss of curb parking would increase the demand for parking elsewhere in the immediate vicinity.

There are numerous locations where the Bay Trail alignment is proposed near a highway widening or interchange improvement. The proximity of the Bay Trail and the roadway improvements, particularly where the space is confined, could present difficulties in achieving a successful design. There are a number of safety hazards posed by potential conflicts between bicyclists and traffic, and between trail users and trains. Most of the potential hazards between vehicles and bicyclists would be imposed on the bicyclists. In general, the greater the traffic volume and speed, the greater the potential for accidents. Bicyclists are put at risk by right-turning vehicles which cross the bicycle lane/route, by parked vehicles maneuvering into the flow of traffic, angle-parked vehicles backing out of the parking space, gravel and other road debris being picked up by vehicle tires and spewed at bicyclists, and by the vacuum created by the mass and speed of a vehicle, which can unbalance a cyclist.

Class II or III bicycle trails on high capacity urban streets can be expected to be the least attractive sections of the Bay Trail due to safety hazards, noxious vehicle exhaust fumes, and necessary breaks in the cycling rhythm at intersection stops. The combination of factors may lead to two responses. Bicyclists may either plan their outing to avoid such trail sections altogether. Alternatively, if they are familiar with the local street system, they may divert to less-congested side streets. Bicyclists diverting from the designated trail street is not anticipated to cause any significant negative impacts. Bicyclists who do not observe stop signs and signals at intersections could initiate an accident.

Truck-trail user conflicts are the same as posed by any vehicle but differ in degree in some categories. Compared to automobiles, trucks have reduced all-around visibility, broader turning radii, reduced stopping distances, greater mass creating a stronger vacuum at high speeds, and a wider frame requiring greater road width for safe maneuvering. Where the trail uses streets in industrial areas, highway rights-of-way, and truck routes, truck activity creates an incremental hazard increase.

Where the Bay Trail would cross or parallel an actively used railroad line, the proximity of the trail creates the potential for accidents and injury to trail users. Railroad crossing are usually equipped with gates, lights and bells to warn of approaching trains. Parallel trail travel with a rail line poses a difficulty in providing the same level of visual and auditory warning. If active railroad line rights-of-way are utilized for the Bay Trail, liability will be a significant concern.

Development of Bay Trail may necessitate the construction of foot bridges and may increase the demand for access across vehicle bridges where the trail segments are completed on either side of a waterway.

Adoption of the Bay Trail Plan will create a public policy to provide trail access across the vehicle bridges enumerated herein.

Trail users may incrementally increase the ridership of ferries--both the Tiburon/Angel Island ferry which would be a designated part of the Bay Trail and other public ferry routes. The trail alignment in proximity to all the public ferry terminals on the bay would provide an enjoyable and attractive extension of or access to the Bay Trail. The availability and frequency of service on weekends and holidays would be conducive to ferry use as part of a trail outing. The increased ridership is expected to be well within the ferries' service capacity. Where the trail passes marinas there may be increased demand for short-term docking as boating and trail recreations are combined. Development of the Bay Trail may incidentally increase use of water trails.

The availability of public transit has the potential to enhance the trail experience by allowing a longer, non-repeating route to be covered in a outing. Trail users who drive their own vehicle have to make a loop back to return to their vehicle. Transit users may be able to take transit to one trail staging point, walk or bike along the trail to another staging point, and leave via a second transit route. Public transit also makes the trail available to those who do not have private vehicles.

An increase in demand for local and regional transit service and for transit vehicles to take bicycles on board could be expected in the long term as trail linkages are completed. An increased use of public transit could lessen potential negative impacts associated with increased automobile use such as noise, air pollution, traffic congestion and hazards, and impacted parking conditions. Conversely, where transit is unavailable or inadequate, access will be increasingly dependent upon private vehicles. In these areas, the long term potential for the negative impacts associated with automobiles would be greatest.

The demand for transit service to and from the Bay Trail is not expected to increase transit impacts and costs significantly in the short term. In trail areas that currently have adequate transit service, transit districts may experience a slight incremental increase in ridership, especially on weekends and holidays when overall system demand is lower. These areas would most likely include San Francisco, much of the Alameda shoreline, and sections of Marin, San Mateo and Santa Clara where there are good transit connections.

### **5.3 Mitigation Measures: Traffic and Circulation**

A portion of the peak weekend, warm weather trips to the Bay Trail can be expected to be captured from other subregional recreational destinations. In other words, out of the total number of recreational vehicle trips on a given day, the Bay Trail may take an increasing portion of those trips as the trail's popularity increases at the expense of other locations which would receive fewer visitors. This potential shifting of recreational traffic patterns as well as additional traffic generated by the Bay Trail will need to be addressed at the project level.

The Bay Trail Plan identifies staging points--points where the trail can be readily reached and parking is available. Initially, existing parking at parks and parking at BCDC shoreline access points should provide sufficient parking. Any future trail promotional/information materials should include identification of staging points to avoid spill-over parking and development of undesignated trails. At the time of project-level trail segment development, analysis should include the adequacy of staging areas serving the project segment. Adequacy should be addressed in terms of parking, traffic congestion, conflict between bicyclists, pedestrians and other recreations within the park. As warranted, additional access points with parking facilities should be created and identified in promotional materials. If any park, initially identified as a staging point, becomes overused in the course of time, it should not continue to be identified as a staging point. Impacts to neighborhoods and sensitive soils from continuing use of undesignated access points may be mitigated through the installation of fencing or vegetative barriers. At the project level, the safety benefits afforded bicyclists with the elimination of curb parking should be weighed against the impacts of parking displaced to other streets in the vicinity. Alternatives, such as development of class III bicycle routes or trail realignment should be evaluated.

Trail construction that would divert and/or slow traffic should be limited to non-commute hours. Potential conflicts between the proposed trail alignment and highway improvements may be resolved through design in most cases. Where a successful design cannot be achieved, the trail alignment may have to be altered.

Where economically and physically feasible, class I trails should be constructed to maximize the public's safety from vehicle conflicts. Class I trails are specifically recommended for locations where the trail parallels highways and other high volume, high speed roads; where roadways are excessively narrow; and where vertical and horizontal curves substantially restrict views of the roadway. Vigilant law enforcement may be needed on trail-designated streets if trail users develop a patterned disregard of intersection controls.

Where the trail would parallel an active railroad line, the trail should be designed to maximize public safety. Recommended design elements include a four- to five-foot tall fence which would create a safety barrier, but not impede the movement of deer and other such animals. Distance between the trail and rail line should be as great as feasible. A well-maintained asphalt trail surface will encourage trail use, as well as visually define the trail. Parking, the approach to the trail, and any other trail facilities should be located on the trail side of the fencing barrier; attractions to the cross the rail lines should be minimized or eliminated as feasible. Cautionary signing should be installed, especially at intersections where the fencing barrier is discontinuous and there is a greater opportunity for trail users to move into a hazardous position.

Creating access for trail users on existing vehicle bridges is most likely to be achieved by retrofitting existing bridges, using a demand-responsive bicycle shuttle, and/or utilizing buses which are equipped to carry bicycles. Retrofitting bridges could include a cantilevered bicycle deck from the side of the bridge or opening shoulders to trail users. Implementing agencies should consult with CalTrans and transit agencies to define and implement effective solutions.

Improved mass transit service to the trail may be accomplished through route restructuring, designing routes for better intermodal connections (e.g., to and from BART, Caltrain or ferries), and schedule trade-offs from low patronage routes to trail serving routes. Capital costs for adding bicycle racks to transit fleets could be minimized by incorporating these features in fleet specifications when replacement vehicles are purchased. Improvements in designs for accommodating bicycles would have to be addressed if many transit districts were to offer access to bicycles.



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## 6. Hydrology and Flooding

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### 6.1 Setting

The Sacramento and San Joaquin Rivers, which drain the Central Valley of California, provide most of the fresh water that flows through the San Pablo and San Francisco Bays from the East Bay delta area where the rivers join. The Central Valley drainage system is approximately 50 times larger than the network of ephemeral streams and small rivers that drain directly into the San Francisco Bay.<sup>39</sup>

The proposed Bay Trail would pass through eight drainage basins that flow into San Francisco, San Pablo, and Suisun Bays. The following are brief descriptions of the basin locations and identification of principal streams. Figure 6-1 illustrates the San Francisco Bay Region's major drainage divides and basins.

1. The San Francisco Embarcadero and Golden Gate National Recreation Area are part of a basin that drains the ocean side of the San Francisco peninsula.
2. The largest basin drains the bay side of the peninsula, the South Bay, and East Bay to the western end of the Carquinez Strait. The principal streams of the area (Guadalupe River, Coyote, Stevens, and Alameda Creeks) are concentrated in the South Bay.
3. Crockett, Port Costa, and Martinez are in a basin that empties central Contra Costa County.
4. Benicia east of Southampton Bay drains into the Carquinez Strait and Suisun Bay.
5. The Napa River valley basin extends from the west side of Southampton Bay to the Sonoma-Napa County line along the ridgeline that separates the Napa and Sonoma valleys.
6. Sonoma Creek drains the Sonoma valley watershed. The proposed trail would cross the Sonoma Creek and several of its tributaries.
7. The Petaluma River basin extends from the western slope of the Sonoma Mountains to Novato. The Petaluma River and the Novato Creek are principal waterways of the basin.
8. The remainder of Marin County is in a single basin. Its principal creeks are the Las Gallinas and Corte Madera Creeks.

The numerous streams that drain into the bays transport silt, sand and rock debris from the local uplands and when deposited along the bay edge form alluvial plains and estuarine mudflats. The coarser materials carried by the Sacramento and San Joaquin Rivers deposit most of the heavy materials in the Central Valley. The lighter silt and clay particles are suspended into the San Francisco Bay where they may settle during periods of low water turbidity and become "bay mud".

The proposed trail alignment crosses numerous streams, rivers, estuaries, sloughs, and substantial stretches of plains and area of underlying bay mud formed in the hydrologic process. In the course of the Bay Area's development, flood control projects have been instituted to make more land available for development and further protect existing development from cyclical flooding.

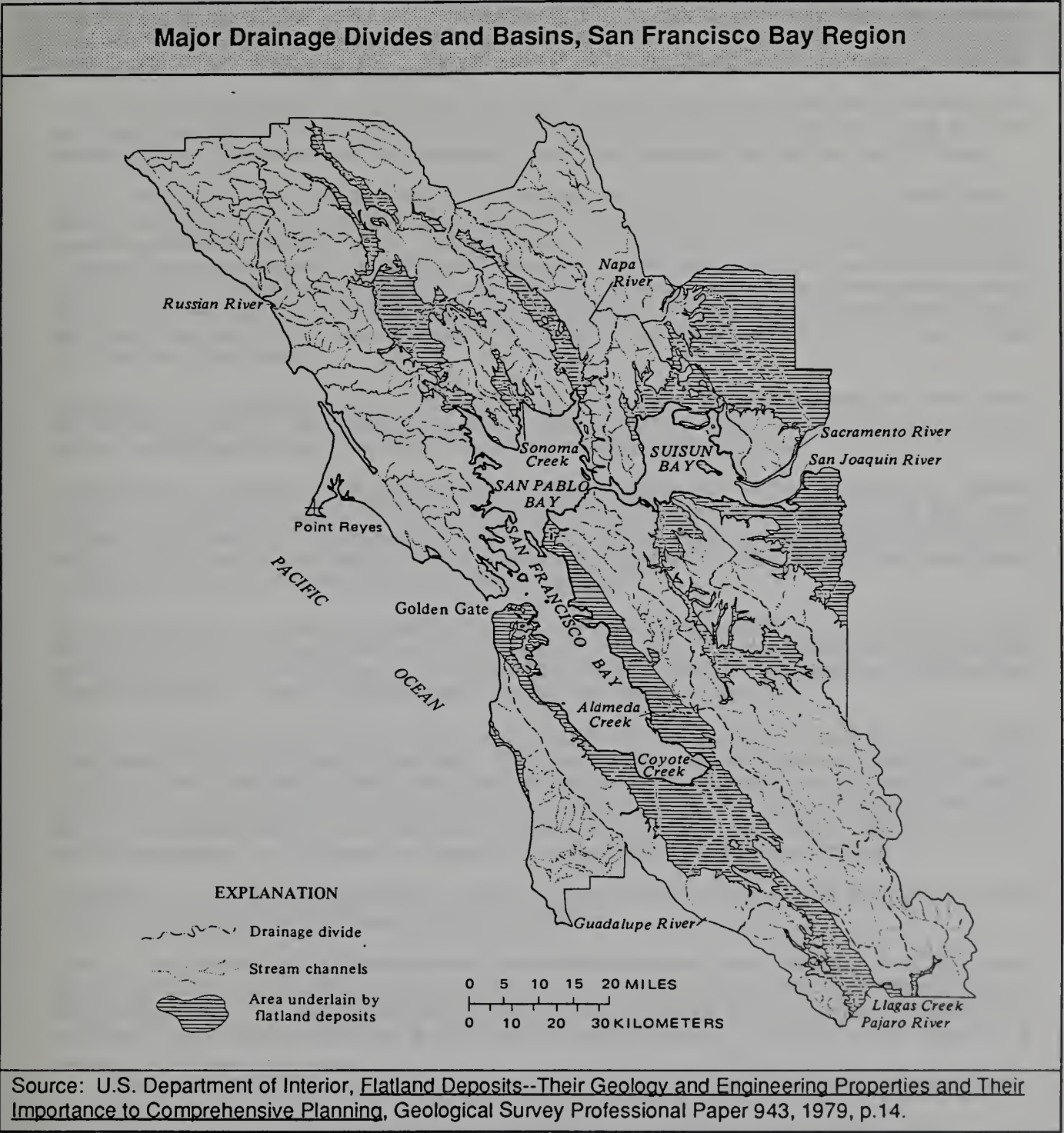
The Federal Emergency Management Agency (FEMA) has prepared maps that show areas subject to flooding one foot or more in depth from the highest flood level that could be expected over the course of 100 and 500 year periods. The areas within the 100-year flood limit stand a one percent chance of being

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<sup>39</sup>U.S. Dept. of the Interior, Geological Survey, Flatland Deposits of the San Francisco Bay Region, California--Their Geology and Engineering Properties, and Their Importance to Comprehensive Planning, Geological Survey Professional Paper 943, 1979, p. 12.



Figure 6-1





flooded in any given year. Flood control projects notwithstanding, much of the bay lowlands, flood plains and stream courses proposed to be traversed by the Bay Trail are within the 100-year flood limit. The FEMA maps do not further define areas subject to higher frequencies of flooding. Information received from flood control districts, although not a comprehensive review, has indicated that trail alignment areas subject to multiple flooding events in the recent years (10-20 years) are limited.

The Federal Flood Insurance Administration requires that the finished floor elevations of new structures be constructed above the 100-year flood elevation or that commercial buildings otherwise be flood-proofed. There is no requirement that roadways or trails to be constructed above flood hazard levels.

Flood control districts are established throughout the Bay Area, usually by city and county jurisdictions, to protect the public and property from flood hazards. Flood control project may consist of dams and reservoirs, floodwater storage basins, creek channelization, and/or levees. Flood control districts provide necessary project maintenance, as well as the removal of silt and debris from flood control channels and natural creeks. In some areas the Bay Trail is proposed to be located on top of flood control levees, cross flood control channels and otherwise cross property owned by districts or land to which they have an easement. Development of the trail in areas where the district has real property interest will require a legal agreement with the district.

**Peninsula and South Bay** In the Burlingame area the shoreline is partly lowlands and partly diked with existing sections of trail on top of the dikes. There have been two to three incidences of flooding from extremely high bay tides. The flooding was minor and lasted only a few hours.

In Santa Clara County, the trail is proposed along portions of levee tops on the major streams. Stevens Creek, San Tomas Aquinas Creek, and Guadalupe River levees are above the 100-year flood level. Levees on the bay side in Sunnyvale's Bayland Park and portions of Coyote Creek in San Jose are currently below the 100-year flood elevation. Santa Clara Valley Water District expects that these levees will be filled in the future to provide 100-year flood protection.<sup>40</sup>

The most extensive and damaging flooding has been along the lower reaches of Coyote Creek, including the lowland of Alviso. Coyote Creek was overbanked in 1982 and 1983, resulting in the flooding of 800 acres and 4,000 acres, respectively.<sup>41</sup> The Santa Clara Valley Water District is presently implementing a phased flood control project on Coyote Creek to reduce the severity of flooding.

Flood control district policy regarding the public use of district right-of-way and structures varies considerably from one jurisdiction to another. San Mateo County does not have any established policy.<sup>42</sup> The Santa Clara Valley Water District would require a joint use agreement with a public agency who would assume the responsibility for development and maintenance of public facilities, and liability for public use.<sup>43</sup> Any bridges that might be constructed would have to be above the 100 year flood elevation and not create an obstruction to stream flow that would increase or divert the flow to other areas.<sup>44</sup>

**East Bay** The East Bay has few flooding problems. Minor overflow ponding occurs in Union City west of Union City Boulevard near the intersection of Dyer Street.

The Bay Trail alignment is proposed to cross land which the Alameda County Flood Control District owns or has easements. The District has permitted development of public trails by open space districts along its lands and projects. The District requires an agency, in a formal agreement, to take the responsibility for trail construction and maintenance and provide for public liability. The trail must be designed to

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<sup>40</sup>Bill Hoeft, Civil Engineer, Santa Clara Valley Water District, personal communication, November 10, 1988.

<sup>41</sup>U.S. Army Corps of Engineers, Coyote Creek Flood Control Final Environmental Impact Statement, January 1987, p.2.

<sup>42</sup>George Zinckgraf, Senior Civil Engineer, San Mateo County Public Works, personal communication, November 7, 1988.

<sup>43</sup>Bill Hoeft, November 10, 1988.

<sup>44</sup>Sue Tippets, Associate Civil Engineer, Santa Clara Valley Water District, personal communication, November 10, 1988.

accommodate access to District maintenance vehicles and sustain the vehicle weight. Bridges must be clear spans; no piers can be set into channels. They must be designed to provide unimpeded maintenance access and have vertical clearance from flood waters.<sup>45</sup>

**North Bay** In 1982, portions of Highway 29 near the intersection of Highway 37 in Vallejo was flooded by wind-driven rains and high tides. It was an unusual combination of factors; however, the portion of Highway 37 near White Slough has flooded with some frequency. Lake Chabot watershed improvements during the last few years has reduced the flooding hazard in the vicinity and will further reduced the hazard to a 100-year event on Highway 29 east of the slough with the completion of the final, Phase 4 improvements. Flooding along Highway 37 over White Slough and other related issues are under discussion by a multi-jurisdictional task force as a result of a CalTrans proposal to widen and raise the highway.

The Vallejo Sanitation and Flood Control District only holds easements to property for their operations. Use of the District's easement area requires their consent. The District's design criteria include protective fencing along open channels, clear span bridges above the 100-year flood elevation, and all weather surfaces on trails.<sup>46</sup>

## **6.2 Impact Analysis: Hydrology and Flooding**

Development of new trail segments may require minor grading, particularly in inland areas, to meet the Plan's goal of a maximum 5 percent grade. Any alteration to the natural grade and build up of the trail bed potentially could impede and/or divert rainwater sheetflow.

Construction and use of the trail could impact water quality in several ways. Erosion and sediment deposition into adjacent creeks and wetland areas could result from trail grading and trail users walking or riding off of the trail surface into uncompacted soil. Litter in waterways could decompose and affect water quality.

Flood control district operations, particularly the removal of silt and debris from creeks and channels, could affect the material and design of new segments of trail where they cross or parallel flood control projects/structures. The equipment used for channel clearing operations varies with the size of the waterway and associated size of the job. For the largest of waterways, a crane with a shovel is mounted on a tractor and operated from the top of the levee. The tractor moves along the length of the channel as it removes the silt and deposits it in trucks on the levee. Tractor treads and the extreme weight of the filled trucks can substantially damage asphalt. From a cost and maintenance perspective, asphalt may not be an appropriate trail surface in such circumstances where it would periodically be subject to damage.

In some South Bay areas where the trail is proposed to be located on top of levees which are currently not at 100-year flood protection levels and further filling is anticipated, some all-weather trail surfaces would not be compatible with levee improvements. An all-weather surface which is filled over could act as a lense in the levee and allow water to filter through. The cost of installing and removing an all-weather trail may not be economically warranted if the use of the trail prior to levee improvements is limited.

Flooding has the potential to damage the trail and be hazardous to trail users. Strong water currents could rupture or wash out an asphalt trail. Floodwater that seep into the trail bed would reduce its structural resilience to weight, making the surface subject to warping and rupture under pressure until such time that the bed has dried and regained it tensile strength.

The Bay Trail's proposed close proximity to floodwater on flood plains, in streams and flood control channels, proximity to bay tides which can contribute to flood events, and proximity to the Bay's wave action can pose a safety hazard to the trail user. The inclement weather associated with incidents of

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<sup>45</sup>Patrick Baker, Environmental Coordinator, Alameda County Flood Control District, personal communication, November 8, 1988.

<sup>46</sup>Michael Hoehn, Engineer-Manager, Vallejo Sanitation and Flood Control District, personal communication, November 15, 1988.

stormwater flooding can be expected to significantly reduce the number of trail users that might be at risk during a flood event.

### **6.3 Mitigation Measures: Hydrology and Flooding**

Flood control districts and local public works departments should review project-level trail drainage plan details for adequacy.

Appropriate erosion management practices should be required and employed at the trail construction phase, including grading and construction in dry weather conditions, minimizing the area of grading, revegetation of graded areas, trapping of sediment laden-runoff, and frequent site inspections to insure control measures are working properly and problems are corrected.

Potential litter problems and erosion caused by trail users going off the trail surface may be mitigated by providing convenient trash receptacle and signing to discourage littering and caution people to stay on the trail. A detailed approach appropriate to the trail area and anticipated level of use should be developed at the project level.

Alternative trail surfaces should be evaluated for compatibility with flood control operations. Possible alternatives include a compacted gravel surface, reinforced earth, and prefabricated polyethylene boardwalk sections that can be disassembled and removed during work periods.

Draft Bay Trail policy 21 recommends that the nature of the trail vary according to the locale and nature of the terrain encountered. Alternative trail surfaces should be investigated for levee top trails when raising of the levee is anticipated. Acceptable surfacing would include compacted gravel, prefabricated boardwalk sections that can be disassembled and removed during filling, and simple grading for levees constructed of wet dredge spoils.

Local jurisdictions should review the nature, degree, and frequency of flooding within the project area at the time of trail development to assess the relative risk to trail users and the need for mitigation measures. Mitigations could include minor trail realignments, raising the trail above the 100-year flood elevation, installation of safety barriers, or development of a program for trail closing when flooding is imminent.



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## 7. Geology and Soils

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### 7.1 Setting

As illustrated in Figure 7-1, the alignment of the proposed Bay Trail is predominantly along relative flat alluvial plains and fill overlying bay mud. The the north bay and along the Carquinez Strait the trail would pass over areas of sedimentary and volcanic rock. The elevation of the trail would range from near sea level to approximately 150 feet msl along the Carquinez Scenic Drive near Martinez. The majority of the trail area is below 20 feet msl.

The natural grade of the trail alignment is characteristically near flat along the bayshore where it crosses filled areas and alluvial plains. Where the trail extends inland, the trail alignment crosses rolling hills and valley bottoms. Inland grades have not been inventoried, but where the trail is proposed to parallel or use street and highways, design standards are generally indicative of the approximate grades that might be encountered. Rural and urban highways in rolling terrain can be at 4 to 5 percent grade depending on the design speed; the lower the maximum permitted speed, the higher the grade a vehicle can trail. Urban arterials can be constructed at up to 9 percent grade in rolling terrain provided the speed does not exceed 30 miles per hour. Over short distances grades can be expected to exceed nine percent.<sup>47</sup>

The geologic profile and soil composition of the project area pose several conditions that must be considered in any development proposal. One is soil stability. Bay mud is unconsolidated, saturated with water, has very low bearing strength and is plastic under pressure. Varying thicknesses of bay mud or changes within the composition of the mud can cause differential settlement. Differential settlement occurs when localized sections of earth settle at relatively slower and faster rates than one another. Any rigid surface or structure constructed over such soil would be subject to increasing stress as the surface level became increasingly uneven. Differential settlement can also occur over uncompacted fill of differing materials and strength. Fill over bay mud, common around the Bay's perimeter, requires soils analysis and special foundations to avoid structural damage to buildings.

In the southernmost end of the Bay, from Redwood City to Fremont, there are numerous salt evaporation ponds. In some locations, the trail would be on top of the levees that form the ponds. Unlike inland levees used in flood control projects which are compacted and engineered, the salt pond levees and a few other bayfront levees are composed of uncompacted dredge spoils. These levees are subject to severe and continual settlement as the levees sink into the underlying bay mud, spread and erode into the water. The rate of settlement varies from one location to another, but on the average, levees must be raised with additional depositions of sludge every ten years. The waterlogged material can take up to two years to dry out sufficiently to be graded. Prior to grading, the surface is extremely rough and hazardous to walk on.

Bayland surface soils are moderately to highly expansive. When dry the soil compacts and may form superficial cracks; with moisture the soil expands. Again, the movement of the soil can be source of stress to structures, particularly if drainage is inadequate.

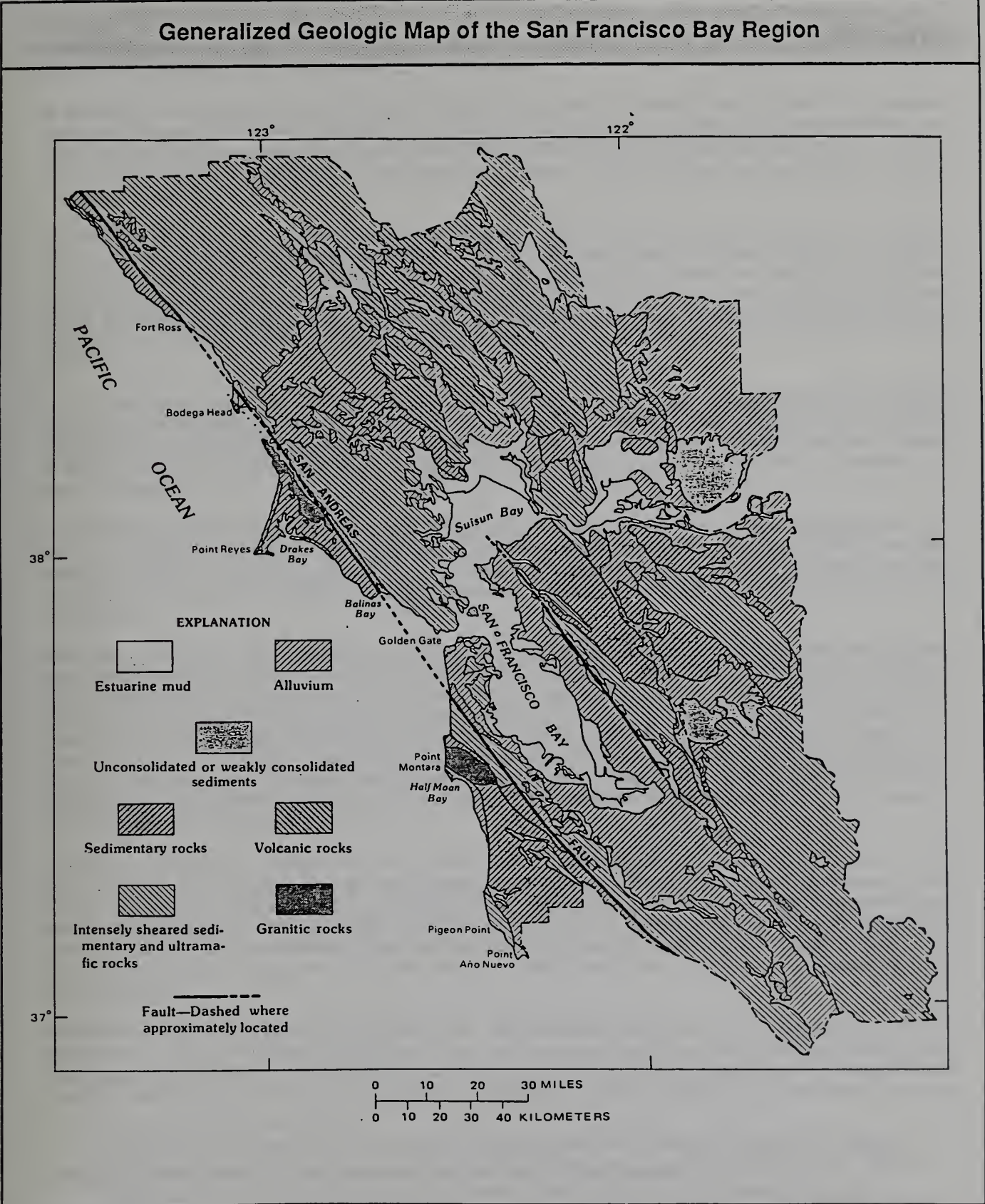
The San Francisco Bay Area is one of the most seismically active locations in the United States. The two largest faults in the Bay Area are the San Andreas, located to the west of the project area trending northwesterly through the San Francisco peninsula and western Marin County, and the Hayward Fault, trending northwesterly through the East Bay and terminating in San Pablo Bay. The Hayward Fault bisects the proposed Bay Trail in Richmond west of the Richmond Country Club. The California Department of Conservation advises, "A large earthquake on either the Hayward or the San Andreas fault poses a major

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<sup>47</sup>American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 1984, p. 632.



Figure 7-1



Source: U.S. Department of Interior, Geologic Principles for Prudent Land Use--A Decisionmaker's Guide for the San Francisco Bay Region, Geological Survey Professional Paper 946, 1983, p.16.



threat to the entire bay area."<sup>48</sup> There are numerous smaller fault traces around the Bay Area that have the potential for damage but to a lesser extent.

In addition to the direct damage that can be caused by ground shaking, earthquakes can generate secondary hazardous reactions, particularly in bay soils. Depending on the thickness of the soil layers and other factors, seismic intensity amplification of bedrock motion can occur where bay mud overlies alluvium, or in various layers of alluvium, or potentially most serious, in areas where bay mud directly overlies Franciscan bedrock.

Liquefaction can occur when loose, water saturated granular silt and sand is subjected to earth shaking. The earth shaking can momentarily cause the soil particles to lose contact with one another in the watery medium and transform into a liquid state. Unless the soil is confined, the soil will be capable of flowing and provide no resistance to the pressure of any overlying structure. Structures are then at risk to tilt and sink during the moment of liquefaction. While most of the proposed Bay Trail would be over bay soils having relatively the highest potential for liquefaction in the Bay Area, the likelihood for liquefaction to occur is low.<sup>49</sup>

Upland landslides have been historically one of the most consistent, widespread and costly geologic problems in the Bay Area. The landslides most commonly move as debris slides, slumps, earth flows and rock falls. The potential for landslide largely relates to the stability or weakness of the soil and rock, degree of slope, presence of water, and load. In addition to the normal range of occurrence, earthquakes can trigger landslides.

**Peninsula and South Bay** This segment of the Bay Trail is characterized by a predominance of bay mud with overlying fill. There are a few isolated spots of sheared sedimentary rock in San Francisco including Hunter's Point and at Sierra Point. There are few places along the trail alignment with any significant grade. One place with a notable grade is at the easterly end of San Bruno Point in South San Francisco.

**East Bay** From San Jose northward to Richmond the trail alignment crosses only bay mud and alluvium and grades are level or slight. The trail is bisected by the Hayward Fault in Richmond. From Point Pinole to the Carquinez Strait, sedimentary rock is uplifted from the bay and form cliffs. Indicative of the area along the southerly side of the strait is the detailed physical characteristics of the Carquinez Scenic Drive between Martinez and Whites Marina to the west provided in a recent environmental impact report. The area is subject to landslides of two basic types. Deep-seated slides result from the fractured and jointed shales which have poor long-term slope stability. Shallow earth-flows result from the movement of soil on steep slopes. The steepest slopes in the area have a 55% grade and the roadway, which is proposed as part of the Bay Trail, averages 10%.<sup>50</sup>

Levees at the Hayward Regional Shoreline are a type of hybrid between the engineered levees of more inland flood control projects and the wet, dredge spoil construction of salt ponds. The levees which overlie bay mud, need to be raised on a five-to-ten year cycle, depending on the rate of settlement and erosion from tidal action. The levees are raised with dry material of high clay content. The work may close levee top trails for up to two weeks. Levee slopes subject to strong tidal action are rip rapped. Because of the rapidity of natural revegetation on newly filled and graded levee tops, no program of revegetation has been necessary.

**North Bay** Unlike other portions of the Bay Trail, the proposed alignment would cross volcanic rock in the Sonoma Valley. The North Bay is more generally characterized by bay mud near the shoreline and large masses of intensely sheared sedimentary and ultramafic rock in the Vallejo area and through Marin County. Relatively long and consistent grades can be found along the north side of San Pedro Peninsula

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<sup>48</sup>California Department of Conservation, Division of Mines and Geology, Earthquake Planning Scenario for a Magnitude 7.5 Earthquake on the Hayward Fault in the San Francisco Bay Area, 1987, p.1.

<sup>49</sup>Association of Bay Area Governments, "Earthquake Mapping Project--Working Paper #4, Liquefaction Potential Mapping", March 1980.

<sup>50</sup>EIP Associates, Carquinez Shoreline Trail and Staging Area Draft Environmental Impact Report, prepared for the East Bay Regional Park District, September 1987, p. 4-5.

in San Rafael, along Paradise Drive in Tiburon and a steep grades between the southern end of Sausalito and the Golden Gate Bridge.

## **7.2 Impact Analysis: Geology and Soils**

Grades up to 2 percent will accommodate the widest range of users. Steeper grades would require increasingly greater physical conditioning of the trail user. Trail users can be expected to select and use those sections of the trail that are well within their capabilities for recreational use. The steepness and length of grade could be a significant factor in the distribution of trail users along the trail alignment.

The trail's bayside location presents a number of geologic and soil hazards which may have various degrees of impact depending on localized site conditions and the composition of the trail. In general, any damage to a graded earth surface or gravel surface trail can be rectified with grading and/or additional gravel. An asphalt surface would be less flexible, more likely to sustain damage requiring higher cost repairs.

Differential settlement and expansive soils could create broad waves or bulges in the trail surface. In an asphalt trail, the vertical distortion would create stress in the material that could lead to surface cracks. If water is able to penetrate to the trail's base material through the cracks, the base material will weaken and potholes can develop when the asphalt ruptures under pressure it cannot support alone. A compressed gravel surface would have greater flexibility, and its porous surface would not be subject to structural deterioration like asphalt. The unlevel surface of the trail is not expected to create any usage problems; however, potholes and other breakages in an asphalt surface could pose a minor hazard to trail users.

Depending on the severity of an earthquake, there could be a range of impacts to the trail. It should be noted that the Bay Area is subject to numerous earthquakes every year and the vast majority are minor and do not cause damage. A severe earthquake could cause the trail surface to heave, crack, torque, rupture and/or distort the trail's alignment. It is also possible for an earthquake to cause structural failure in dikes and levees. A trail on top of a levee or dike could be destroyed with a major structural failure.

Damage could also occur to foot bridges and large, vehicle bridges and their approaches. Vehicle bridges built prior to 1971 were built under less stringent seismic resistance standards than the post-1971 period and, although most such bridges have been retrofitted, they remain more prone to seismic damage.<sup>51</sup>

In the event of liquefaction, the trail would follow the undulations of the earth's surface and possibly sink into the soil. If the soil was uncontained the soil would flow outward and result in a general depression. Depending upon the amount of movement, an asphalt trail would be under stress and subject to cracking and rupture.

Soil settlement caused by an earthquake would be the least likely to cause damage, provided the settlement was gradual over a broad area. The trail under these conditions could have sufficient flexibility to avoid damage. If the settlement resulted in a localized depression, the trail surface could rupture.

The relatively extreme settlement associated with uncompacted levee soils makes asphalt an inappropriate trail material for levee tops. Asphalt would not have sufficient flexibility to respond to the earth movement without being damaged. The cyclical filling of levees makes the use of asphalt impractical from an economic perspective.

The impact of a landslide, whether triggered by an earthquake or not, could vary from minor to major depending on the trail's position relative to the slide. If the trail was at the bottom of the slope and buried by the slide, the damage might be relatively minor. If the trail was on the slope, the trail could be severely pounded by the slide material, be undercut by the slide, or be part of the slide material. In the latter case, repair could involve slope stabilization, trail realignment, cut and fill of the slope to create a trail bed, and reconstruction of the trail itself.

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<sup>51</sup>California Department of Conservation, p. 100.

For all the geological hazards that cause stress and deterioration of the trail's surface, the repair can generally be expected to be simple and relatively inexpensive. Repair could require minor regrading, new base material, and resurfacing. Unlike a building, damage or deterioration to one portion of the trail can remain localized and not undermine the integrity of the whole.

Potential soil erosion and sedimentation impacts and mitigations are discussed in Chapter 6, Hydrology and Flooding.

### **7.3 Mitigation Measures: Geology and Soils**

To maximize the the Bay Trail's use by trail users with the widest range of physical capabilities, the Plan's design guidelines propose a maximum of 5 percent grade over short distances. Draft Bay Trail policy 19 recommends that the trailhead signing program should include information describing the relative difficulty of the trail as a guide for trail users with mobility limitations.

Draft Bay Trail policy 21 recommends that the trail design vary in accordance with the terrain. Where asphalt construction is deemed most appropriate, CalTrans bikeway structural section standards are recommended as the minimum standards for asphalt concrete trail construction to meet a wide variety of geological and soil conditions. The standard is as follows:

A minimum pavement thickness of 2 inches of asphalt concrete is recommended. Type 'A' or 'B' asphalt concrete (as described in Department of Transportation Standard Specifications), with 1/2- inch maximum aggregate and medium grading is recommended. Consideration should be given to increasing the asphalt content to provide increased pavement life. Consideration should also be given to sterilization of basement soil to preclude possible weed growth through the pavement.<sup>52</sup>

Earth movement under the trail that causes stress in the asphalt surface can be mitigated by designing in flexibility and providing good maintenance. The oil in asphalt that provides flexibility will oxidize over time and the paving surface will become brittle. A 5 1/2 to 6 percent asphalt content is recommended for flexibility while maintaining sufficient solidity for bicycle riding. Flexibility can also be improved with increased thicknesses of base and surface materials; however, there are addition costs which may not be merited except in unusual site specific conditions. Good maintenance of the trail surface to insure water resistance will help to maintain structural integrity. Slurry seal, or a similar protective surfacing, is a recommended cost effective preventative treatment for water repellence.

Where the trail would be located on the top of levees which are periodically raised with wet dredge spoils, an alternative trail route should be determined at the time of project implementation to mitigate the extended periods of trail closure.

A cement treated base can mitigate the effects of extremely expansive soils. However, the increased cost of the base treatment must be weighed against the estimated repair and maintenance costs of an untreated base.

In areas where the trail can reasonably be expected to be at risk from superficial landslides, mitigations could include a protective retaining wall or debris fence, filter fabric or gunite over exposed cut surfaces, or alignment of the trail to maximize the distance from unstable slopes. Determination of localized landslide hazard conditions and appropriate mitigations measures may require detailed analysis by a registered soils engineer.

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<sup>52</sup>California Department of Transportation, Highway Design Manual, January 1987, p. 1000-6.



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## 8. Vegetation and Wildlife

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### 8.1 Setting

#### Definition of Wetlands

Of all habitats with which the Bay Trail Plan is associated, wetlands are one of the most prevalent and environmentally valuable. "Wetland" is a broad term, definable in a variety of ways. Like the San Francisco Bay, which itself is a continuum of biotic communities from deep channel bottoms to seasonally-wet marsh pools, wetlands compose a diverse grouping of habitats. They are generally characterized as transitional lands between terrestrial and aquatic systems where the water table is at, near, or slightly above the surface. Along the San Francisco Bay, most wetlands have historically been subject to tidal action. Since wetlands constitute the most significant plant community within the project area, a closer examination of the term's meaning is needed.

Wetlands were once common along the bayshore, but are a relatively scarce resource now. They contribute valuable wildlife habitat and are the foundation of the Bay's ecosystem. Plants and invertebrates such as worms and mussels occupy mudflats and tidal marshes, providing food sources for juvenile fish, shorebirds and waterfowl. There has been and continues to be considerable debate over what land can be classified as wetlands because of the degree of historic modification of the bayshore and the seasonal nature of some coastal marshes. In addition, some bayshore areas retain wetland features even though they have been removed from tidal action. Precise boundaries and definitions of wetlands also remain elusive as they may differ somewhat according to the regulatory perspective of the applicable agencies.

Among the major land managers of bayshore wetlands, the East Bay Regional Park District (EBRPD) defines these habitats in its 1988 Master Plan as having one or more of the following attributes:

- 1) at least periodically, the land predominantly supports hydrophytes [plants that grow in water or saturated soils];
- 2) the substrate is predominantly undrained hydric [water-saturated] soil; and
- 3) the substrate is non-soil and is saturated with water or covered by shallow water at some point."<sup>53</sup>

This definition would apply to a number of resource areas in the vicinity of the Bay Trail alignment, including fresh, brackish and saltwater marshes; vernal pools; periodically inundated salt flats and salt ponds; stream and river channels and banks; intertidal mudflats; wet meadows and wet pastures; and seeps.

The EBRPD wetland definition is based on the U.S. Fish and Wildlife Service's (FWS) definition, which further subdivides into five categories, covering a range of soil and vegetative conditions, from shallow, "subtidal" areas to rocky or seasonally dry "intertidal" areas. The FWS has no formal regulatory powers over wetlands, but does provide comments to the U.S. Army Corps of Engineers permit applications to place fill in wetlands. Were the Bay Trail to use any federal funds, be designated as a national recreation trail, or require federal permits, the FWS would comment on the project.

Wetlands, as interpreted by the Army Corps of Engineers (COE), are those lands below the high tide line or unfilled areas that are below the historic mean high tide line, including lands that are now dry. The COE issues permits for the discharge of dredge or fill materials in wetlands, excepting those made for transportation structures. The COE's jurisdiction over wetlands is derived from Section 404 of the Clean Water Act, which states that wetlands refer to "those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a

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<sup>53</sup>East Bay Regional Park District, Master Plan, 1988, p. 6.

prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

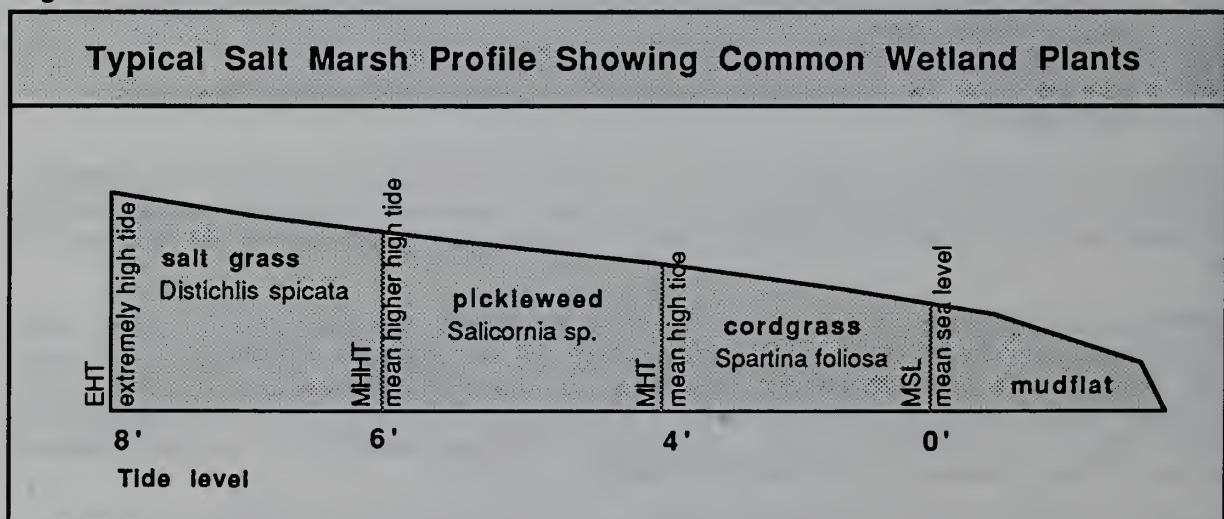
### Wetland Character of the Bayshore

The ecology of bay tidal marshes is both subtle and diverse. An overview of wetlands characteristics is provided in this section to give the general setting for portions of the Bay Trail that would follow the Bay shoreline and provide access to existing trails in or near wetlands and existing levees which may be used for new trails. A detailed analysis is not relevant for the purposes of this document, since the Bay Trail alignment specifically avoids fill of wetlands. In addition, many studies have already been written on the Bay's wetlands and their status. Persons interested in this topic should consult the numerous available references, some of which are listed in the "References" section of this report.

The biological importance of wetlands is a function of their size, productivity, and the great number of species they support. They produce the basic nutrients that form the foundation of the food chain. Where the flow from creeks and rivers blend with the ocean tides, the nutrient levels are particularly rich. The marshes and mudflats along the shoreline of the Bay are, therefore, a source of food and shelter to a wide variety of fish and wildlife. Hundreds of thousands of birds along the "Pacific Flyway," one of the primary western migratory paths, use the Bay's edge as a resting, nesting and feeding area. Over a million waterfowl visit the Bay each year. The San Francisco estuary has historically been the largest contiguous tidal marsh system on the Pacific Coast of North America.<sup>54</sup> Even though the extent of wetlands in the Bay has been diminished by 95 percent since the 19th century, the approximately 31,360 acres of undiked marsh that remain represent 40 percent of all salt marshes in the state.<sup>55</sup> Tidal marshes today extend along 125 miles of the bayshore; however, much of the presently existing wetland resource has been diked, which removes it from tidal action. About 80 square miles of former bay lie behind dikes and function as seasonal wetlands.<sup>56</sup>

Salt marshes are naturally found along the Bay in areas that are somewhat protected from winds and storm or ocean waves. They are characteristically composed of three to four plant zones which have developed in response to the harsh, tidal environment (Figure 8-1).

Figure 8-1



<sup>54</sup> Michael Josselyn, The Ecology of San Francisco Bay Tidal Marshes: A Community Profile, 1983, p. 1.

<sup>55</sup> Frederic Nichols, et. al. "The Modification of an Estuary," Science, Volume 231:7, February 1986.

<sup>56</sup> Nancy Wakeman, "Development of Regional Wetland Restoration Goals: San Francisco Bay," Wetland Restoration and Enhancement in California, edited by Michael Josselyn, 1982, p. 32.

The mudflat community is typically the lowest zone, and is characterized by algae, diatoms and invertebrates. It is usually found between low water and mean sea level. The other three zones are composed of upright herbaceous vegetation. The lower zone is predominantly composed of cordgrass (*Spartina foliosa*). Extending from mean sea level to the high tide line, this zone is inundated twice daily. The middle zone, lying between mean high to mean higher tide, is characterized by pickleweed (*Salicornia sp.*). Pickleweed is a low-growing plant, less tolerant of tidal influences; it is the most commonly found plant of coastal marshes. The upper zone, also known as the high salt marsh (an area approximately from mean higher high tide to extreme high tide), is dominated by salt grass (*Distichlis spicata*) which is tolerant of only occasional tidal inundation. Other characteristic plant species in this zone include the Alkali Heath (*Frankenia grandifolia*) and sea lavender (*Limonium californicum*).

The low salt marsh, characterized largely by cordgrass and pickleweed, occurs frequently as a band of vegetation along sloughs and mudflats. This habitat is considered to be one of the most productive of all plant communities in California. This marsh type is vital to the estuarine system as a supplier of food and is critical to unique wildlife in this habitat, including endangered species like the clapper rail. The middle salt marsh is almost as productive as the low salt marsh and supports a wide variety of birdlife, as well as the salt marsh harvest mouse, an endangered species. Relatively extensive portions of both low and middle salt marshes remain at Sand Point in Palo Alto, Dumbarton Point, and in the Petaluma River area. The low salt marsh is generally regarded as limited to the San Pablo and San Francisco Bays.<sup>57</sup>

The high salt marsh has been virtually eliminated throughout the San Francisco Bay. Where not otherwise diked, grazing has reduced this transitional habitat to a band about three meters in width or less.<sup>58</sup> Narrow as this band is, it plays a valuable role in the survival of bay wildlife, providing habitat for the salt marsh harvest mouse, the yellow throat, and the salt marsh song sparrow among other species. High wetlands are needed also by many shorebirds for resting and protection from winter storms and waves.

Above the high salt marsh is the upland community, which may include grass, shrub or wooded habitats. In urban areas, these are generally disturbed habitats and are often referred to as "ruderal areas." Where the soil is suitable for plant growth, a variety of "weedy" species characterize this area, among them brome grasses, thistles, dock, mallows, poison hemlock and anise. When ruderal areas become seasonally flooded by rains, they provide wintering grounds for waterfowl and shorebirds. Vacant lands crossed by the Bay Trail would share many of the same weedy species as the ruderal areas, although with less potential variety due to a lower water table.

The Bay Trail would cross a number of creek channels, and would parallel several channels, notably in the instances of the Guadalupe River and Coyote Creek in the San Jose area. Wetlands along streams are referred to as riparian zones or forests; these naturally comprise a particularly diverse association of herbaceous plants, shrubs and trees that grow along the banks of the water course. In the Bay Area, all riparian marshes and forests have been extensively modified by urbanization and flood control projects. Where they remain, the most prominent trees found in the riparian canopy would include one or more of the following: red alder (*Alnus rubra*), willow (*Salix spp.*), California bay (*Umbellularia californica*), cottonwood (*Populus dewmontii*), sycamore (*Platanus racemosa*), box elder (*Alnus oregona*), and big leaf maple (*Acer macrophyllum*).

For a listing of the commonly found plant species, as well as the common vertebrate and invertebrate animal species associated with the Bay's wetlands, refer to Appendix A, "Characteristic Plant Species in Habitats Adjacent to the Bay Trail."

Remnants of native upland habitats such as the coastal prairie and scrub habitats would be crossed by the Bay Trail, notably in the vicinity of the Carquinez Strait and Point Pinole. Both tend to be found on windy, exposed sites with shallow, rocky soils. The extant patches of coastal prairie are made up of a variety of annual and perennial grasses. Generally adjacent are coastal scrub habitats, composed of clustering, low-

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<sup>57</sup> Jones and Stokes, et. al., Protection and Restoration in San Francisco Bay. Volume II, Prepared for the U.S. Department of Fish and Wildlife and California Department of Fish and Game, August 15, 1979, p. 8.

<sup>58</sup> Ibid, p. 8.

growing shrubs amid scattered grassy openings. Among the most commonly found shrubs in the coastal scrub landscape are coyote brush, sagebrush species, poison oak, and ceonothus.

The Bay Trail would be skirting, or using existing fill to cross, a number of the perennial and seasonal wetlands of the Bay, including sloughs, streams, and marshes. What follows is a summary of the characteristic wetland types by subregion and a listing of the major wetlands that the proposed Bay Trail alignment would be adjacent to or passing through on existing levees. Descriptions of the character of each wetland are beyond the scope of this document; more detailed profiles of individual wetlands adjacent the trail alignment would be appropriate at the project implementation level.

**Peninsula and South Bay** The wetland resources of this region, bounded by the Golden Gate to the north and Fremont to the south, increase in acreage from north to south. San Francisco has no significant remaining marshland. The remnant wetlands of San Mateo and Santa Clara Counties have also become isolated by development practices. The South bayshore receives the smallest inflow of fresh water from rivers and streams of the three major reaches of the Bay. Almost all of the fresh water entering the Bay is by way of the Sacramento and San Joaquin Rivers, whose combined watersheds are fifty times larger than the sum of the local drainages. It is thus the most saline reach of the Bay. Still, the marshes here are cut by a considerable number of sloughs.

The most commonly found wetland types in this region are salt marshes, intertidal mudflats and salt ponds. Most of the South Bay's wetlands have been greatly modified by diking for the creation of salt ponds or managed wetlands; the area south of the Dumbarton Bridge has the highest concentration of salt ponds.

The San Francisco National Wildlife Refuge, established in 1972, protects over 18,000 acres of South Bay wetlands. Public access is limited to about 2 percent of the refuge to minimize disturbance to the estuarine life, the resident harbor seals, and the multitude of waterfowl and shore birds that rest and feed here, especially during the winter. Elsewhere in the two counties, there are numerous points of public access to the wetlands.

Known and probable habitats for several endangered species are located in the South Bay, including habitats of the salt marsh harvest mouse (*Reithrodontomys ravinentris*), in the Redwood City vicinity and the California clapper rail (*Rallus longirostris obsoletus*) along sections of the Palo Alto/Mountain View shoreline. Species that are listed as endangered that are occasionally observed in this area along with portions of the North and East Bay wetlands are the American peregrine falcon (*Falco peregrinus anatum*), the California brown pelican (*Pelecanus occidentalis californicus*) and the southern bald eagle (*Halietus leucocephalus leucocephalus*).

Most of the remaining salt marshes in this area have some form of public access. Distinctive examples of the Peninsula and South Bay wetlands include the San Francisco Bay National Wildlife Refuge with its extensive system of salt ponds and marshes, and the Palo Alto Baylands Wildlife Refuge, composed of a salt marsh, sloughs, mudflats, an artificial duck pond, and a 600-acre flood basin with fresh and brackish water ponds. Additional bay wetland preserves in the Peninsula and South Bay are included in Table 3-1.

**East Bay** The wetland resources of the East Bay in the vicinity of the proposed Bay Trail are largely concentrated along the bayshore of Union City, Newark, Hayward and San Leandro. The shoreline north of Richmond to Martinez is almost entirely devoid of salt marshes. This is due to the relatively unprotected shoreline, the geological uplift, and the more extreme effects of the tides, currents and storms on this reach of the Bay. The San Francisco Wildlife Refuge extends into Alameda County as far north as the Dumbarton Bridge. Diked salt marshes and salt ponds are prevalent in the remnant wetlands that compose this portion of the South Bay Estuary.

Salt ponds are the predominate use for wetlands in Fremont and Union City. This activity extends as far north as Hayward. Salt evaporators and salt marsh intermingle throughout the southern shore of Alameda County.

Most of the East Bay's remaining marshlands outside of the San Francisco Bay Wildlife Refuge have been set aside as parks or preserves. One exception, the Emeryville Crescent to the west, would be separated from the Bay Trail alignment. The Hayward Regional Shoreline, which would connect with the Bay Trail, has both low and high wetland areas. The park has been the site of a major wetlands restoration project since 1984, achieved largely through breaching dikes between existing salt ponds, followed by extensive grading and marsh revegetation. The trail would follow San Leandro Regional Shoreline and Arrowhead Marsh. Like Hayward Shoreline, these parks are operated by the East Bay Regional Park District. Between Berkeley and Martinez, there are relatively few wetlands. Small marshes remain from Richmond to Pinole, primarily at the mouths of streams, including Wildcat, San Pablo, Refugio and Pinole Creeks.

The San Francisco Bay Wildlife Refuge and many of the East Bay's shoreline parks harbor a great variety of wintering waterfowl and shorebirds. As such, they represent critical feeding, resting and nesting habitat because of the intensive urbanization that has encroached on the remaining wetland areas. A number of waterfowl and shorebirds rely on the East and South Bay wetlands for nesting sites, including the killdeer, Forster's tern, Caspian tern, California gull, northern harrier, snowy plover, black crowned night heron, black phoebe, marsh wren, black-necked stilt, marbled godwit, gadwall, cinnamon teal, American avocet, snowy egret, Wilson's phalarope, pied-billed grebe, eared grebe, northern pintail, common moorhen, mallard and American coot. The East Bay wetlands provide habitat and nesting colonies for several endangered species (e.g., the California clapper rail, California least tern, and the salt marsh harvest mouse). The species and habitat requirements of these species are described in the next subsection.

**North Bay** The Bay Trail alignment would pass west of Suisun Marsh and north of the San Pablo Bay Marsh, which is bounded on the north by State Route 37. There are two marshes that together comprise about 68,600 acres and represent the most extensive remaining wetlands in the Bay Area.

The marshes that correspond to the Napa and Petaluma Rivers, which the Bay Trail would cross by way of existing bridges, are brackish water marshes. This type of marsh, which combines fresh and salt water, promotes active nutrient production and circulation, and supports a rich pool of wildlife. Brackish marshes such as these comprise a variable habitat, with a lower zone typically made up of tules (*Scirpus.sp.*), a middle zone of alkali bulrush (*Scirpus robustus*), pickleweed and cattails (*Typha sp.*), and a high zone characterized by salt grass, and rush (*Juncus balticus*). The natural tidal marshes of the North Bay also support several threatened or endangered plant species, including bird's beak (*Cordylanthus mollis*). They are also noteworthy habitats for the salt marsh harvest mouse, California clapper and black rails, endangered species which are described in the next section.

The Bay Trail would use an existing trail segment in the Benicia State Recreation Area, at Southampton Bay. One of the few freshwater marshes that the Bay Trail would come approach is here. Wintering waterfowl and shorebirds are prevalent. In Marin County, the trail would connect with existing segments at John McInnis County Park and the San Rafael Canal and Bayfront. The trail would also align with existing grades near the salt marshes and relatively undisturbed upland communities of China Camp State Park. All of these wetlands in Marin support a wide variety of wintering waterfowl, and have notable nesting populations of herons and egrets in the spring.

### **Threatened and Endangered Species of the Bayshore**

Both Federal and State legislation have been enacted to protect endangered flora and fauna. Both the United States Endangered Species Act (1973) and California Endangered Species Act (1970, amended 1984) have provisions for designating plant as well as animal species as "threatened and endangered." The United States Department of Fish and Wildlife and the California Department of Fish and Game have published lists of the designated species whose habitat should be protected under law. The 1984 State Act defines endangered species as "a native species . . . which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease".<sup>59</sup> Threatened species means "a native species. . . that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management

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<sup>59</sup> California Endangered Species Act, 1970, amended 1984(Section 2062)

efforts required by this chapter."<sup>60</sup> In addition, the federal government has "candidate" species lists and the state lists "species of special concern" which may be elevated to threatened or endangered status as circumstances change.

As noted in the previous subsection, a number of wildlife species whose habitat or range is located along the Bay are designated as threatened and endangered. The following discussion of these species is drawn from Protection and Restoration of the San Francisco Bay Fish and Wildlife Habitat and the 1987 Annual Report on the Status of California's State Listed Threatened and Endangered Plant and Animals.<sup>61</sup> The discussion of specific species below should not be considered a complete list of threatened and endangered species in the Bay Area, nor does it address candidate species and species of special concern which may be found in the Bay Area. It should be noted that numerous waterfowl on the Pacific Flyway which migrate to or through the San Francisco Bay are California listed species of special concern.

**California black rail** The California black rail (*Laterallus jamaicensis coturniculus*) has been designated as threatened by the State. The black rail's preferred habitat is tidal salt marsh with heavy growth of pickleweed. Rails are also found in brackish and freshwater marshes. Black rails are believed to feed on arthropods, perhaps concentrating their feeding efforts in the intertidal zone of tidal sloughs. Breeding black rails appear to be confined to marsh habitat at the upper limit of tidal flooding.

**California brown pelican** The California brown pelican (*Pelecanus occidentalis californicus*) is included as an endangered species on both Federal and State listings. This subspecies occurs along the Pacific coast from Canada to Mexico. It is occasionally seen in the San Francisco Bay Area, but it does not nest here.

**California least tern** The California least tern (*Sterna albifrons browni*), a Federal and State-designated endangered species, occurs along the Pacific coast from San Francisco Bay to central Baja California during April through September. San Francisco Bay Area nesting sites include Alameda County (Alameda Naval Air Station, Oakland Airport, Bay Farm Island, Coyote Hills salt ponds) and San Mateo County (Bair Island). Nesting colonies are located in flat areas characterized by loose substrate and little or no vegetation. Sites are located near estuaries with a good supply of small fish. The sites must be free from disturbance. Continued human disturbance, particularly from off-road vehicles, predation and flooding along the continuing loss of habitat, have reduced nesting success of this species.

**California clapper rail** The California clapper rail (*Rallus longirostris obsoletus*) has been designated as an endangered species by both the State and Federal governments. Its present breeding range is San Francisco Bay with major populations occurring in San Mateo, Santa Clara, Alameda and Marin Counties and in the Napa marsh. The California clapper rail is restricted to tidal salt marsh, predominantly cordgrass and pickleweed in the South Bay, and bulrushes and Baltis rush in the Napa Marsh. Drainage channels and sloughs inhabited by an abundant invertebrate fauna are also required. Throughout its range, California clapper rail population numbers have been reduced due to losses of suitable habitat. Areas restored to tidal salt marsh in the San Francisco Bay Area could, under suitable conditions, support California clapper rail.

**California freshwater shrimp** The California freshwater shrimp is distributed in small stretches of streams throughout Marin, Sonoma and Napa counties. The shrimp occurs in low elevation streams with a gradient of less than 1 percent. They occur primarily in pool areas away from the main streamflow. During late spring and summer shrimp may also be found on leafy branches of bankside bushes, vines, or hedges which extend into the water. Population trends are not known. The species continues to be endangered by water diversions, watershed erosion, stream sedimentation, riparian removal, agricultural development, grazing within riparian areas and bank stabilization projects which protect streamside homes. Other threats include winery waste and sewage treatment plant spills, exotic fish predation, seasonal dams, and channel clearing for flood protection.

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<sup>60</sup>Ibid., Section 2067.

<sup>61</sup> California Department of Fish and Game, 1987 Annual Report on the Status of California's State Listed Threatened and Endangered Plants and Animals, February 1988.

**Soft bird's-beak** Soft bird's-beak (*Cordylanthus mollis ssp. mollis*) is a sparingly-branched, herbaceous annual plant with stems covered with soft hairs. It grows in the coastal salt marshes and brackish marshes from northern San Francisco Bay to Suisun Bay in Napa, Solano and Contra Costa counties. There are approximately a dozen known occurrences of soft bird's-beak, but in a 1986 survey only three support this bird's-beak. The three extant occurrences appear stable, although one may be impacted by residential development. Two occurrences currently receive some protection by State agencies. One is within the project area and is located at Benicia State Recreation Area.

**Salt marsh harvest mouse** The salt marsh harvest mouse (*Reithrodontomys raviventris*) has been designated endangered by the Federal and State governments. It is found in salt and brackish marshes around San Francisco Bay. A highly cover-dependent species, it is generally found in tidal marshes, but may also occur in diked nontidal marshes. The species' endangered status is derived from the loss of its habitat through diking and filling of tidal marshes. The mouse is recognized as having evolved into a distinct species with two subspecies. (*R.r. halocoetes*) is found in marshes of northern San Pablo Bay and all of Suisun Bay. The southern subspecies (*R. r. raviventris*) is found in marshes of South Bay and some southern marshes of San Pablo Bay (Fisler, 1965). Salt marsh harvest mice characteristically are found associated with the vegetation found in middle and high salt and brackish marshes.

## 8.2 Impact Analysis: Wildlife and Vegetation

With the exception of a few plant species which grow in non-hydric soils, the review of literature on threatened and endangered species in the vicinity of the Bay Trail has indicated that their habitat includes wetlands of one sort or another. Development and use of a trail near, over and through wetlands has the potential to degrade the quality of the wetlands and impact the wildlife which depend on them.

The potential to impact the equilibrium of the ecological system could come from soil erosion, stream sedimentation, removal of riparian vegetation and use of chemicals. Soil erosion and sedimentation could occur during trail grading, particularly from grading the top of levees formed from dredge spoils, and by trail users going off the prepared trail onto undisturbed soils. Removal of some riparian vegetation may be required to construct footbridges over waterways. Local jurisdictions may wish to use herbicides to control trailside vegetation, an activity which could directly affect plants and animals or filter downstream.

Threatened and endangered species in the vicinity of the Bay Trail are noted to be at risk from loss and degradation of habitat, predation, and disturbance by humans. The Bay Trail Plan does not propose new fill to accomplish trails in known marsh areas and should not result in the loss of valuable marshland habitat.

In the North Bay where the trail crosses creeks, watershed erosion, stream sedimentation and riparian vegetation removal could negatively impact California freshwater shrimp if they are at or downstream of the bridge site.

The frequency of human disturbance and the sensitivity of the wildlife to human disturbance are two variables that could determine the potential impact of Bay Trail users on wildlife. The California least tern, for example is known to be particularly sensitive to human disturbance. A recent study entitled Public Access and Wetlands: Impacts of Recreational Use evaluated the what impact the frequency of disturbance had on wetland birds. The report concludes, "It appears that birds in wetlands with high levels of human activity have become acclimated to this disturbance. In areas of less frequent access, birds were far more sensitive to human presence. However, and most importantly, areas of high human use had substantially lower overall bird use than areas of infrequent human use."<sup>62</sup> The report also noted that the available literature on the subject indicates that "reductions in breeding success of wildlife were reported from areas of high public access."<sup>63</sup> From these findings it can be concluded that additional numbers of trail users on existing high use segments of trail will likely have little impact, even in such sensitive areas as trail connections to the San Francisco National Wildlife Refuge. However, infrequently used sections of

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<sup>62</sup>Michael Josselyn, M. Martindale, and J.M. Duffield, Public Access and Wetlands: Impacts of Recreational Use, 1988, Summary, p.1.

<sup>63</sup>Ibid.

existing trails and new segments of the Bay Trail on existing fill in undeveloped areas could potentially pose disturbance impacts to wildlife in nearby habitat.

Another type of human disturbance pertains to plants. Trail construction and maintenance has the potential to damage or destroy rare plant species. Trail users may trample important vegetation or reduce the growth through soil compaction if they leave the designated path.

The California least tern is also noted to be at risk from predators and nesting sites need to be protected.<sup>64</sup> Trail users may wish to bring their domestic animals with them to the trail. If the animals are uncontrolled they could pose hazards to a variety of wildlife.

Beneficial effects of the Bay Trail Plan should also be noted. Upon publication and trail implementation, the Bay Trail Plan will expand the trail experience to a public which is generally unaware of the Bay's resources. Access to the trail and appreciation of the value of the Bay's varied environments could help motivate broader public support for bay and wildlife conservation.

### **8.3 Mitigation Measures: Wildlife and Vegetation**

The Bay Trail Plan proposes policies and goals designed to protect natural sensitive environments. Draft Bay Trail policy 26 states, "To avoid impacts in wetland habitats, the Bay Trail should not require fill in wetlands, and should be designed so that use of the trail avoids adverse impacts on wetlands habitats." Draft policy 2 states an alignment goal to "minimize impacts on and conflicts with sensitive environments," which include sensitive natural environments, such as wetlands.

The particular trail design and alignment will be most important in assessing impacts to wildlife and sensitive biotic environments. Development of any new section of the Bay Trail is likely to require multi-jurisdictional review, each according to their legal authority, although overlapping concerns for vegetation and wildlife impacts can be expected.

A trail maintenance program should be included in the project level proposal. Any proposed use of herbicides could then be assessed for potential adverse impacts.

Although barriers and buffers to protect wildlife from human disturbance have been widely used in public open spaces, there has not been any significant scientific study to determine their relative effectiveness. A survey of park and wildlife managers indicated that high vegetation and channel separations were the most effective barriers. In sensitive wildlife areas, buffers that would screen the view of trail users and their noises from wildlife would appear to be most valuable. Wildlife in areas that already have a regular frequency of human activity is not expected to be significantly affected by the introduction of trail users as the existing wildlife would be substantially acclimated to human disturbance.

Signs should be installed to caution trail users to stay on the trail. Volunteer docent and educational programs can be effective methods of educating the public on proper trail use in sensitive environments and policing, fencing and use of barrier plantings would ensure compliance. General mitigation measures for soil erosion and sedimentation impacts are discussed in Chapter 6, "Geology and Soils."

Policy 18 recommends that domestic pets be prohibited in ecologically-sensitive areas. Signs should be installed to advise of the restriction, consistent with local jurisdictions' policies and regulations.

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<sup>64</sup>California Department of Fish and Game, p.20.

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## 9. Air Quality

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### 9.1 Setting

#### Climate

The trail alignment lies near the shores of the San Francisco and San Pablo Bays, which receive their main air flows from the west through the Golden Gate and from the east through the Carquinez Strait. Wind speeds vary throughout the Bay. A 30-year average of wind velocity in the San Francisco Bay Area (1951-1980) reveals a low mean speed of about 6.9 miles per hour (mph) in December and a high of 14 mph in June.<sup>65</sup> Mean wind speeds of from 10 to 14 mph occur two thirds of the year, and follow a prevailing northwest-southeast axis. Southerly and southeasterly wind patterns prevail in the winter months, while northwesterly winds predominate through the remainder of the year.<sup>66</sup> In general, winds are strongest in the afternoon and lightest during the morning and night hours. The San Francisco Bay moderates the temperature and climate of the region to a large degree. Average temperatures vary slightly in various subregions around the Bay, with a low annual average of 57.2°F at the West Oakland Meteorological Station and a high of 59.6°F in San Rafael.<sup>67</sup> Skies are characteristically clearer in the North and South Bays and more foggy on the upper Peninsula and East Bay, particularly during the late spring and summer months. Clouds cover the Bay Area an average of 47 percent of the time over the course of a year. Mean annual precipitation varies more widely than other meteorological measures: from a low average rainfall of 13 inches in San Jose to a high of 36 inches in San Rafael.

#### Regulatory Background

The Environmental Protection Agency (EPA) was given the authority by the 1970 Clean Air Act to establish federal ambient air quality standards. The Act found the need for primary standards to protect public health and secondary standards to protect public welfare from effects such as visibility reduction, soiling, nuisance and other forms of damage. In 1971, the EPA promulgated federal standards for five major criteria air pollutants: photochemical oxidants (ozone), carbon monoxide (CO), total suspended particulates (TSP), Nitrogen Oxide (NO<sub>2</sub>), and Sulphur Oxide (SO<sub>2</sub>). State ambient air quality standards were established in California beginning in 1969. The Federal and State standards, shown in Table 9-1, offer acceptable durations for specific contaminant levels in order to protect those most susceptible to respiratory problems. Adverse health effects caused by air pollution are outlined in Table 9-2.

The California Air Resources Board (CARB) oversees Federal and State air pollution control programs. CARB monitors existing air quality, determines the State's air quality standards, enforces those standards by limiting allowable emissions from vehicular sources, and is responsible for putting together a State Implementation Plan. The agency has divided the State into a number of single and multi-county air basins. Authority for air quality management within them is delegated to local Air Quality Management Districts which develop local non-attainment plans within their jurisdiction. The CARB has designated most of the Bay Area as the San Francisco Bay Area Air Basin, and placed it under the authority of the Bay Area Air Quality Management District (BAAQMD).

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<sup>65</sup>U.S., Department of Commerce, National Oceanic and Atmospheric Administration, Marine Assessment Branch, Marine Environmental Assessment: San Francisco Bay 1985 Annual Summary, August 1986, p. 12.

<sup>66</sup>California Air Resources Board, Aerometric Data Division, California Surface Wind Climatology by Thomas P. Hayes, et. al, June 1984, pp. 12-18.

<sup>67</sup>U.S. Department of Commerce, p. 26.



Table 9-1

| Federal and State Ambient Air Quality Standards                                                                                                 |                              |                                               |                                               |                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-----------------------------------------------|----------------------------------------------|
| Air Pollutant                                                                                                                                   | Averaging Time               | Federal Standard (Primary)                    | Federal Standard (Secondary)                  | California Standard                          |
| Photochemical Oxidants (Ozone)                                                                                                                  | 1 hour                       | 0.12 ppm                                      | 0.12 ppm                                      | 0.10 ppm                                     |
| Carbon Monoxide (CO)                                                                                                                            | 1 hour<br>8 hour             | 35.0 ppm<br>9.0 ppm                           | 35.0 ppm<br>9.0 ppm                           | 20.0 ppm<br>9.0 ppm                          |
| Sulfur Dioxide (SO <sub>2</sub> )                                                                                                               | 1 hour<br>24 hours<br>Annual | --<br>0.14 ppm<br>0.03 ppm                    | --<br>--<br>--                                | 0.5 ppm<br>0.05 ppm<br>--                    |
| Nitrogen Dioxide (NO <sub>2</sub> )                                                                                                             | 1 hour<br>Annual             | --<br>0.05 ppm                                | --<br>0.05 ppm                                | 0.25 ppm<br>--                               |
| Suspended Particulates (PM <sub>10</sub> ) <sup>1</sup>                                                                                         | 24 hours<br>Annual           | 150 ug/m <sup>3</sup><br>50 ug/m <sup>3</sup> | 150 ug/m <sup>3</sup><br>60 ug/m <sup>3</sup> | 50 ug/m <sup>3</sup><br>30 ug/m <sup>3</sup> |
| ppm = parts per million<br>ug/m <sup>3</sup> = micrograms per cubic meter<br><sup>1</sup> particulate material less than 10 microns in diameter |                              |                                               |                                               |                                              |
| Source: Bay Area Air Quality Management District                                                                                                |                              |                                               |                                               |                                              |

Table 9-2

| Summary of Health Effects of the Criteria Air Pollutants |                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air Pollutant                                            | Adverse Health Effect                                                                                                                                                                                                                                                                                                                                                                     |
| Photochemical Oxidants (Ozone)                           | <ul style="list-style-type: none"> <li>• Eye irritation</li> <li>• Respiratory function impairment</li> </ul>                                                                                                                                                                                                                                                                             |
| Carbon Monoxide (CO)                                     | <ul style="list-style-type: none"> <li>• Impairment of oxygen transport in the bloodstream, increase of carboxyhemoglobin</li> <li>• Aggravation of cardiovascular disease</li> <li>• Impairment of central nervous system function</li> <li>• Fatigue, headache, confusion, dizziness</li> <li>• Fatality possible if very high concentrations encountered in enclosed spaces</li> </ul> |
| Sulfur Dioxide (SO <sub>2</sub> )                        | <ul style="list-style-type: none"> <li>• Aggravation of chronic obstruction lung disease</li> <li>• Increased risk of acute and chronic respiratory illness</li> </ul>                                                                                                                                                                                                                    |
| Nitrogen Dioxide (NO <sub>2</sub> )                      | <ul style="list-style-type: none"> <li>• Risk of acute and chronic respiratory disease</li> </ul>                                                                                                                                                                                                                                                                                         |
| Total Suspended Particulates (TSP)                       | <ul style="list-style-type: none"> <li>• Increased risk of chronic respiratory disease with long exposure</li> <li>• Altered lung function in children</li> <li>• With SO<sub>2</sub> may produce acute illness</li> <li>• Particulate matter, 10 microns or less in size (PM<sub>10</sub>), may lodge in and/or irritate the lungs</li> </ul>                                            |
| Source: Bay Area Air Quality Management District         |                                                                                                                                                                                                                                                                                                                                                                                           |



## **Air Pollutant Trends Around the Bay Area**

Prior to the 20th century, air in the Bay Area air basin was relatively clean. Particulates carried by the wind or injected by lightning-caused fires, and hydrocarbons emitted from vegetation and cooking fires were the only sources of air pollution. Current air quality problems are a consequence of intensive urbanization and industrial development, particularly in relation to the widespread use of motor vehicles by basin residents. Geographic features and meteorological conditions promote the concentrating of these pollutants, because they reduce the ability of the atmosphere to disperse the basin's air pollutants.

The high level of ozone, the chemical component that leads to smog, is widespread in the San Francisco bay region. It poses the most severe and complex air quality problem. Ozone is formed in the atmosphere through a series of photochemical reactions that involve nitrous oxides (NO<sub>x</sub>) and reactive organic compounds (ROG). Because ROG and NO<sub>x</sub> are generated by the burning of fossil fuel, there is no one source that accounts for most of the ROG and NO<sub>x</sub> emissions; numerous sources are distributed around the Bay Area air basin. While the region's greatest ozone level varies from year to year, standards are exceeded most often in the Santa Clara, Diablo and Livermore valleys. The smog problem in the Santa Clara Valley is most acute, since ozone levels have been known to reach the hazardous first stage Health Advisory Level (0.2 parts per million). This is due, in part to the prevailing air circulation patterns. The daytime wind direction is from the mouth of the Golden Gate and moves primarily south toward the Santa Clara Valley. Pollutants from the central bay sources are thus carried to the South Bay, creating higher and more frequent pollutant peaks than in other areas of the air basin. Most of the heavy smog days take place between April and October.

Unlike ozone, carbon monoxide (CO) is a sub-regional problem because CO is a non-reactive pollutant whose major source is motor vehicles. Ambient CO distributions are associated with the spatial and temporal distributions of traffic. Standards set for this category of pollutant are established in one-hour and eight-hour increments. They are occasionally exceeded in those portions of the Bay Area subject to a blend of high traffic density and an inclination toward air temperature inversions during the winter months, notably in northern Santa Clara, western Alameda and Contra Costa, and southwestern Solano Counties.

Levels of total suspended particulates (TSP) in the Bay Area characteristically exhibit a pattern of low values by the coast, increasing with distance inland. They reach their highest levels in the enclosed valleys like the Santa Clara and Livermore valleys where smog also tends to accumulate. The federal secondary standard is occasionally exceeded in many Bay Area cities.

Planning for the attainment and continuance of Federal and State air quality standards in the Bay Area is the combined responsibility of the BAAQMD, ABAG and the Metropolitan Transportation Commission (MTC). These agencies prepared the 1982 Bay Area Air Quality Plan, which calls for the imposition of additional controls on stationary and mobile sources of ROG and CO, and established a schedule for adopting and implementing these controls. While the Bay Area has attained the national ambient standards for CO emissions by the 1987 target compliance date, it has failed to do so with ozone levels. Because of ozone standard violations, the BAAQMD will have to promulgate additional ozone control strategies and estimate a new attainment date in order to comply with the Clean Air Act. Otherwise, the Federal government could impose a funding moratorium on the construction of highway improvements and major stationary sources of air pollutants.

## **9.2 Impact Analysis: Air Quality**

Air quality impact are composed of two types: temporary impacts due to project construction and long-term impacts due to project operation. Impacts in each category can be classed as having impacts on local or regional scales.

### **Construction Impacts**

As this is a program level EIR, no construction schedule or project scenario has been formulated for the trail's implementation. Therefore, no air quality analyses have been carried out yet for the future development area. It can be assumed that there would be minimal or no construction-related impacts on

air quality for those portions of the trail that are installed as class II bicycle lanes. Construction activities would be primarily limited to the class I segments, and would consist of minor grading, laying and compacting of trail surface materials and signing. Construction activities could temporarily increase particulate concentrations in or near the trail installation area. Equipment and vehicles generate dust during clearing, grading and excavation. Construction vehicle traffic on unpaved surfaces would be minimal, but would nevertheless generate dust, as would wind blowing over exposed ground.

The construction vehicles and equipment, as well as the worker commute vehicles would emit exhaust at the sites, contributing to the regional pollutant totals. Given the small number of vehicles to be involved in construction of trail segments at any given time and the relatively short segments of trail to be built over the multi-year implementation period, both the local and the regional impacts of these emissions would be negligible. Noxious odors could be generated by construction activities involving the grading of bay mud or activity near or around sludge ponds.

### **Operational Impacts**

Vehicles driving to and from staging areas would be a contributing source of additional air pollutants generated by the implementation of the project. It is premature to make estimates on the number of motor vehicles that could be engaged in this activity. Impacts related to increased CO and ozone concentrations resulting from trail-destined traffic, could be offset by several "substitution" factors. This includes the potential for the trail to be used as an alternative to automobile transportation for commuting and local trips, as well as for recreation, coupled with the use of the trail as an alternative access to regional shoreline parks. Operational impacts will need to be examined on a project-level basis. On a regional, program-level basis, none is apparent.

## **9.3 Mitigation Measures: Air Quality**

Where the trail would be constructed as a class I path during the dry season, unpaved construction sites should be sprinkled with water twice daily. Disturbance of soil should be minimized where possible. Stockpiles of dirt or sand should be covered. Any trucks on the construction site hauling soil, sand or debris should be kept covered. The above-named measures would reduce TSP emissions.

Engines of construction equipment should not be kept idling when they are not being operated and should receive periodic maintenance; this would reduce air pollutant emissions associated with their use.

Additional emissions would be somewhat offset by bicyclists using the trail system as an alternate transportation route, particularly those who are commuting or using it for other non-recreational purposes. Traffic mitigation measures are described in Chapter 5, "Traffic and Circulation."

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# 10. Noise

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## 10.1 Setting

### Acoustic Characteristics

Sound is a form of radiant energy that is conveyed by pressure waves in the air. It is characterized by two parameters --amplitude and frequency.

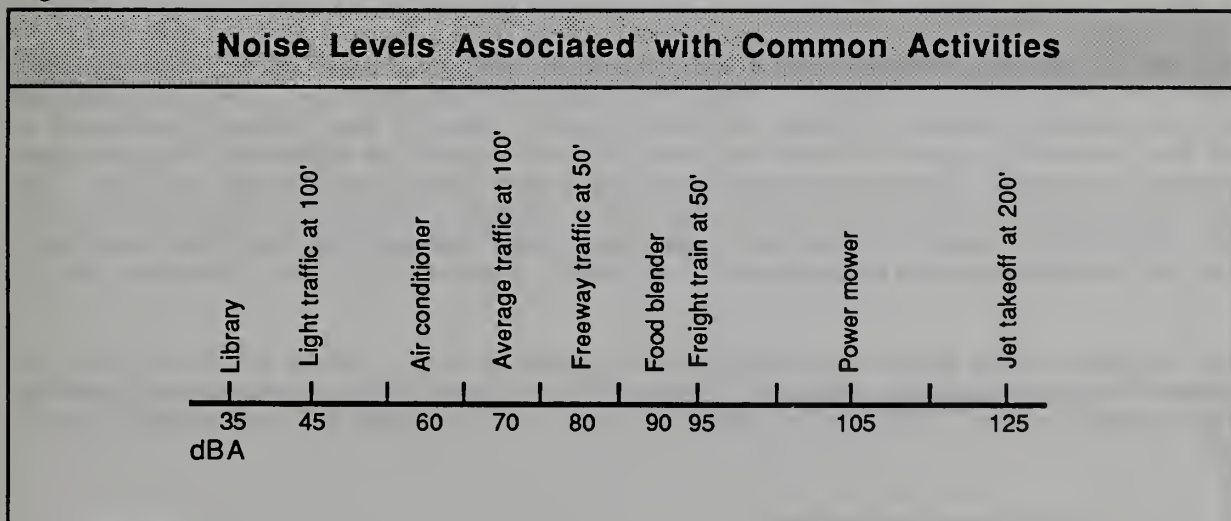
Amplitude refers to the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) and is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 0-1 dB increase in amplitude with a perceived doubling of loudness and establish a 2 dB change in amplitude as the minimum audible difference for the average person.

Frequency applies to the number of fluctuations of the pressure wave per second. The human ear is not equally sensitive to sound of different frequencies; some sound waves are so slow that humans cannot hear them. Environmental sound is usually measured in "A-weighted decibels" (dBA), which represents the normal range of human hearing. The scale extends from about 0 dBA to about 140 dBA.

Noise can be defined as unwanted and disturbing sound. The human response to environmental noise is subjective and varies considerably from individual to individual. The effects of noise can range from interference with sleep, concentration, and communication, to physiological and psychological stress, and, at the highest intensity levels, to hearing loss. Sleep disturbance occurs when interior noise levels exceed 40 to 50 dBA. The U.S. Environmental Protection Agency estimates that 12.2 percent of Americans living in urbanized areas are exposed to an average sound level greater than 70 decibels; this is a level at which permanent hearing loss can occur with extended exposure.<sup>68</sup>

For the sake of comparison with potential noise levels along the Bay Trail, Figure 10-1 illustrates some typical noise intensity levels.

Figure 10-1



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<sup>68</sup>As cited in Draft San Leandro General Plan , Appendix D, 1988, p.1.

## **Noise Sources Around the Trail Alignment**

Noise sources in the immediate vicinity of the project alignment span the range of transportation system and industrial sources, including aircraft, highway, freight and passenger trains, heavy equipment operation, arterial and collector road noises. The trail would experience background noise from four large airports in the region, the San Francisco, San Jose and Oakland International Airports, and Moffett Field Naval Air Station. Aircraft approaching these airports could generate noise levels in excess of 65 dBA, affecting those portions of the trail within a mile of the airport, even without direct overflights.

Major streets and highways are the most prevalent and significant sources of noise in the project area, creating a background noise between 50 and 65 dBA, where trails are in close proximity to major streets and highways. Highway noise affects the alignment on portions of the Peninsula from Brisbane to Palo Alto (Route 101), in the East Bay from Hayward to Richmond (Routes 880 and 80), and the North Bay along Routes 29 in Solano County, 37 in Sonoma County and 101 in Marin County. These background noise levels are the highest where the trail alignment comes closest to the major freeways: the Bayshore Freeway, from Brisbane to Burlingame; and the Nimitz Freeway, from Oakland to Albany.

Freight and passenger trains can periodically be heard beside many portions of the eastern and northern reaches of the trail. The proposed alignment closely parallels the Southern Pacific right of way in along the bayshores of Newark, Oakland, Berkeley, Richmond, Pinole, Hercules and the north shore of Contra Costa County. In the North Bay, the trail follows the Southern Pacific and Northwestern Railroad rights-of-way from Napa Junction to San Rafael. Where these segments of the proposed trail are within 50 feet of the railroad right-of-way, they can be subjected to occasional noise levels in the range of 88 to 93 dBA, assuming a train speed of 45 to 50 mph (which the trains do not generally reach in the Richmond to Oakland corridor).

The operation of heavy equipment like conveyor systems, fork and hydraulic lifts, compactors and backhoes affects the alignment area where it is adjacent to salvage yards, landfills and heavy industrial zones. For example, outside noise levels within 50 feet of a transfer station for refuse would be in the range of 70 to 85 dBA, with fork lifts generating a peak noise level of 85 dBA.<sup>69</sup> The trail, however, would not generally be located within 50 feet of these noise sources.

There are few "sensitive receptors" (e.g., hospitals, nursing homes and schools) close to the trail alignment. Current use of the alignment area in places where the trail is already established includes dog walking, jogging, bicycling and similar recreation activities that do not create significant noise effects.

## **10.2 Impact Analysis: Noise**

Daylight noise levels from human voices would increase for residential areas of the trail alignment, particularly on weekends and holidays. These increases would be intermittent only, but could be annoying for adjacent residents; however, recreational activity along the Bay Trail would represent a minimal level of noise compared to most other noted sources adjacent the alignment. Human voices would be the main source; conversation typically generates a noise level of about 50 dBA at 12 feet. This would fall to about 32 dBA within 96 feet of the alignment, or less than the customary background level of libraries. The trail then, would be quieter than most adjacent roads, whose noise levels may range from about 45 dBA for lightly traveled thoroughfares at 100 feet to in excess of 85 dBA for freeways at 100 feet.

The trail alignment would generate increased human activity at staging areas and other points of congregation like picnic areas and restrooms. There would be increased noise emitted by cars entering and leaving staging areas. Unlike the trail alignment, these would represent relatively stationary noise sources.

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<sup>69</sup>Bolt et. al., Noise from Construction Equipment and Operations. Building Equipment and Home Appliances, U.S. Environmental Protection Agency, 1971.

One potentially significant noise impact of the trail would be the disturbing influence of human voices on the feeding and nesting habits of some waterfowl and shorebirds in coastal marshes. This impact category is discussed among other possible effects of increased human activity in wetlands in Chapter 8, "Vegetation and Wildlife."

### **10.3 Mitigation Measures: Noise**

Major points of congregation and staging areas along the trail should not, when feasible, be located closer than 50 feet from housing units to avoid potential noise intrusion, as well as to adequately accommodate privacy concerns. As earlier noted, parking and congregating points will consist of existing facilities wherever possible. Along the alignment itself, whenever the trail passes close to residential areas, signs should be posted requesting that trail users respect the privacy of adjacent residents.

Where wetland areas are crossed by existing levees and trails, signs should be periodically posted, asking people to pass quietly to avoid disturbing the wildlife.



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## 11. Public Services and Utilities

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### 11.1 Setting

Public services currently provided along existing segments of the Bay Trail include police and fire services, and public park/open space personnel where the trail passes through dedicated open spaces and parks. City police departments provide the service within incorporated cities and sheriff departments provide service for the unincorporated areas. In certain cases, police services are supplemented with private services. Park personnel offer general information and historical/ecological educational programs at interpretive centers to park visitors as well as fill administrative functions.

Utilities used along existing segments of the trail are concentrated in parks and dedicated open space areas. The type of utility and volume of use reflects the nature of the park and, as parks are often incrementally developed, the progress of the park toward completion. The most intensely developed areas can be expected to have a full range of utilities. The typical development/utility associations are water and sewerage connections for drinking fountains and rest rooms, electricity for lighting, heating and food service cooking (less frequently, natural gas for heating and cooking), and telephones at staging areas and major public facilities.

**Peninsula and South Bay** Shoreline at Mountain View contracts with a private firm to patrol the park facilities and uses volunteer rangers for public information and educational services. Because Shoreline is built on top of a former landfill, it is in the unusual position of generating methane gas which is extracted and sold for commercial use.

**East Bay** The East Bay Regional Park District has a Public Safety Division that provides security services at all of its parks. In some areas, the park district contracts the Public Safety Division's services to city parks that are in close proximity to EBRPD facilities.

**North Bay** During the summer months, state rangers give public presentations on local history and ecology at Angel Island and China Camp State Parks. As state police, rangers provide the security at all state parks. In addition, rangers provide initial fire and medical response within the parks. The local city or county fire department provides the primary fire response according to their jurisdiction. Rangers either have advanced first aid training or are Emergency Medical Technicians (the same certification as ambulance technicians). McNear's Beach in San Rafael is completely developed with a full range of recreational facilities which require utilities including lighting, heated swimming pool, snack bar, and restrooms.

### 11.2 Impact Analysis: Public Services and Utilities

Initially, the impact to public services and utilities upon the adoption of the Bay Trail Plan is expected to be insignificant. The Plan will identify existing segments of the Trail and additional use of these trail segments may occur as a result of the dissemination of the Plan. Because the intrinsic recreational value of the existing segments will maintain their current level of attraction, and the minor additional number of users will be dispersed over the entire project region, the demand for additional services and utilities is expected to be insignificant.

When development of new trail segments is proposed, impacts upon public services and utilities will have to be evaluated on a more detailed scale. Two conditions could create service demands and utility use of a significant level. As segments of trail are connected into substantial lengths, the trail will have greater recreational value and is likely to attract more users from a larger, regional base. The increasing volume of users can be expected to create an increasing service demand, increasing utility use, and create a need for additional facilities which incidentally have utilities. Secondly, if local public services are already fully utilized, the additional service demand from trail users will require a higher level of resource allocation to

meet the demand. These longer term impacts to public services and utilities will have fiscal impacts to the city, county, or open space district that is responsible for the maintenance and development of the trail.

### **11.3 Mitigation Measures: Public Service and Utilities**

No mitigation measures are required now. Specific facility upgrades and additions should be identified at the project implementation level and phased in as needed.

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## 12. Archaeological and Cultural Resources

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### 12.1 Setting

Prior to the arrival of Europeans, the land rimming the San Francisco Bay was home for three major cultural and linguistic groups of California Indians--the Ohlone, Coast Miwok and Patwin. The highest and perhaps the most diverse concentration of Native Americans living in western North America dwelt in the Bay Area, largely due to the San Francisco estuary's abundant natural resources, the moderate climate and varied habitats. Highly decentralized, these peoples lived primarily in tribelets, extended clans usually made up of less than 100 individuals. The Ohlone, otherwise referred to as the "Coastanoan" peoples, dwelt along the West, South and East Bays. The Coast Miwok occupied the area now bounded by Marin County and southern Sonoma County, while the Patwin lived along the Bay and interior of what are now Napa and Solano Counties. All three tribal groups were based on hunter-gatherer economies. They built their principal, semi-permanent villages adjacent to the Bay's smaller estuaries and stream mouths, and their seasonal villages in the surrounding hills. Living quarters tended to be small, conical, grass-thatched lodges constructed on a framework of bent poles. Major villages were located close to one of the major food sources of these tribes, shellfish and fish. The seasonal villages, occupied largely during the summer months, were close to the other major staple foods, in particular acorns, deer, as well as other small game. The diversified environments around the Bay provided a rich resource base for the area's indigenous peoples.

Most of the material culture which has been found pertains to the food gathering habits of the aboriginal Californians. Shellmounds or middens, large collections of discarded shells, generally revealed a heavy consumption of mussels and clams.<sup>70</sup> These mounds once dotted the bayshore, particularly in the East and North Bays. Some, in fact, were several hundred feet in diameter. A few remain in places like Brooks Island near Richmond and Coyote Hills Regional Park in Fremont. Mortars and baskets and other remnants of their material culture related to the gathering and processing of acorns for use as bread meal are the artifacts typically encountered.

From the arrival of the Spanish in the late 18th century, through the initial influx of Anglo-Americans in the late 1840's, the Coastanoan, Patwin and Miwok life ways rapidly deteriorated and the population became dislocated. Mission Dolores was founded in San Francisco in 1776; over the next half century it was joined by three other missions in the Bay Area. With the establishment of the mission system, many California Indians lost their cultural identities through religious conversion and the breakdown of the traditional subsistence economies. When the American period began in 1846, the relatively few remaining Miwok and Coastanoan found work in the agricultural, ranching, dairying and lumbering industries that grew up in the region.

Evidences of prehistoric implements and features used in the hunting and gathering processes are found in the cultural deposits associated with the dwelling sites. Archaeologists and anthropologists, beginning in the early 1900's became concerned about the future of the rapidly disappearing shellmounds. Throughout the bayshore area, soils from prehistoric sites were being used as fill material and road base, erasing evidence of the human habitation of the region that extends back millenia. In fact, as more sites were investigated around North-central California, it became apparent that the archaeological record of human habitation in the Bay Area dates back to at least 4000 B.C.<sup>71</sup>

Archaeological sites may exist in the vicinity of the proposed class I portions of the Bay Trail. Those that have been recorded are cataloged with the Northwest Information Center of the California Archaeological Inventory at Sonoma State University, which maintains the most complete data base of its kind. The

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<sup>70</sup>Quaternary Research Group. Archaeology in Alameda County: A Handbook for Planners, prepared for the County of Alameda, October 1976, p. 9.

<sup>71</sup>EIP Associates, Hamilton Field Master Plan and Redevelopment Plan. Draft Environmental Impact Report, prepared for the City of Novato, July 1988, p. 3-324.

Center can conduct a records search of those sites within or near the Bay Trail alignment. However, given the scope of this plan and potential changes in the alignment's precise location, a reconnaissance of the records would be premature at this time.

In addition to prehistoric locations, there are several historic cultural resource sites lying within the existing segments and along class II portions of the Bay Trail. Among known historic sites are Benicia State Historic Recreation Area, Ardenwood Regional Preserve in Fremont, the Petaluma Adobe, China Camp State Park and Coyote Hills Regional Park.

## 12.2 Impact Analysis: Archaeological and Cultural Resources

Most of the land through which class I sections of the trail are proposed has already been disturbed, due to the high level of urbanization, and extensive grading and bayfill that underlies much of the trail alignment. Potential archaeological sites would tend to be found in relatively undisturbed bayshore areas and along streams that are part of the trail system. Sites would be primarily related to middens, burial and village and camp sites; remains may be located in the following areas in the vicinity of the Bay Trail alignment:

1. **Guadalupe River, San Jose.** The corridor, especially from the Southern Pacific Railroad right-of-way on the north to Highway 101 on the south is extremely rich in archaeological resources, including middens, cemeteries, and associated artifacts, particularly above the five-foot contour. Archive research indicates that six sites have been recorded in or adjacent to the river corridor which may be associated with the system and connector trails. Brief descriptions of the sites are contained in the Guadalupe River Planning Study.<sup>72</sup>
2. **Coyote Creek, San Jose and Milpitas.** Field investigations along the creek corridor from its mouth to six miles upstream have revealed no prehistoric sites and one historic-period deposit of early 20th century artifacts. Historical records also indicate a total of 11 farmstead sites from the late 19th century located along Coyote Creek.<sup>73</sup>
3. **Bluebird Dump and Roberts Landing, San Leandro, north of the Hayward Shoreline Regional Park.** No prehistoric resources have been encountered in either of these contiguous parcels. Historic records indicate that there were rancherias of Christian Indian farmers after 1829. A survey performed in 1981 revealed two significant historic period resources in the Roberts Landing area: 1) the remains of docks and structures from the mid-nineteenth century shipping point called Robert's Landing and 2) remains of the Trojan Powder Works (1906-1964), previously one of the major industries of Eden Township.<sup>74</sup> Material from the Powder Works have also been recovered from the Bluebird Dump, mostly in the form of shards of ceramic, glass, bone, wood and metal.<sup>75</sup>
4. **Carquinez Strait to Martinez, Contra Costa County.** Spotty records exist along this reach of the Bay, necessitating further field investigation. There are no recorded archaeological findings in the stretch of coast immediately west of Martinez comprising the first phase of the East Bay Regional Park District's Carquinez Shoreline Trail, which is proposed to become part of the Bay Trail.<sup>76</sup>

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<sup>72</sup>Santa Clara Valley Water District, Guadalupe River Planning Study : Draft Engineer's Report and Draft Environmental Impact Report, March 1982, pp. 44-50.

<sup>73</sup>U.S., Army Corps of Engineers, Coyote Creek Flood Control, Santa Clara County. Final Environmental Impact Statement, January 1987, p. 8.

<sup>74</sup>Archaeological Resource Service, "Literature Search and Field Reconnaissance of the Citation-Jeras Property, San Leandro Bayshore, Alameda County," prepared for Environmental Science Associates, Inc., Foster City, April 1981.

<sup>75</sup>George R. Miller and Michael J. Sawyer, Subsurface Archaeological Testing of the Bluebird Dump Site, CA-Ala-416H, San Leandro, California, prepared for Alameda County Road Department, 1979, p.2.

<sup>76</sup>EIP, Carquinez Shoreline EIR, p. 4-15.

5. **Glen Cove, Vallejo.** A prehistoric site has been identified in the vicinity of the area west of Benicia State Recreation Area.
6. **Hamilton Field, Novato and the NWRR right-of-way.** The trail would pass through the west side of Hamilton Field military reserve, which contains three archaeological sites.<sup>77</sup>

The six sites discussed above provide rough delineations of known archaeological sites in the plan area that will merit closer review at the project level stage, to ascertain whether any archaeological evidence is present within the Bay Trail alignment. If, during the project planning phase, evidence of archaeological resources is encountered along the trail alignment, its potential significance must be determined. CEQA guidelines define an "important archaeological resource" as one which:

- (1) is associated with a recognized person or event
- (2) can provide information of public interest and use in scientific research
- (3) has a special quality such as largest, oldest, best example
- (4) is at least 100 years old and has stratigraphic integrity; and
- (5) involves important research questions that can be answered only with archaeological methods.<sup>78</sup>

A positive impact of discovery of historic or prehistoric relics within the alignment would be the opportunity created by the trail's presence to develop interpretive information and protective features around these sites.

## **12.3 Mitigation Measures: Archaeological and Cultural Resources**

Guidelines for mitigating the effects of development on prehistoric and historic cultural resources are provided by CEQA. The potential for archeological sites should be positively identified at the project level. When specific alignment areas are believed to have archaeological sites, lead agency staff should then require a field reconnaissance by a qualified archaeologist as part of the assessment of the project. If cultural resources are encountered, on-site preservation is advocated to avoid damaging them. Preserving the site is important from the standpoint of maintaining the relationship of the artifacts to one another.

In the event of discovering human remains in any location other than a dedicated cemetery, there should be no further excavation or disturbance of the site until the respective county coroner has been informed and has determined that no investigation of the cause of death is required. If the remains are of Native American origin, the tribal descendants of the deceased individual(s) will make a recommendation to the owner or lead agency responsible for the excavation work, as to how to treat or dispose of the remains and any associate grave goods.<sup>79</sup> Exceptions would be made for when the Native American Heritage Commission was unable to identify a descendant or the descendant failed to make a recommendation within 24 hours of being notified by the commission.

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<sup>77</sup>EIP, Hamilton Field Master Plan, pp. 3-325 through 3-331.

<sup>78</sup>California Office of Planning and Research, The California Environmental Quality Act, Appendix K Archaeological Impacts.

<sup>79</sup>California Public Resources Code, Section 5097.98.



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## **13. Growth Inducement**

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This section discusses the ways in which the Bay Trail Plan could foster economic or population growth, or the construction of additional housing, either directly or indirectly.

Land uses in the vicinity of the Bay Trail alignment are generally restricted by not only the City or County, but by numerous regional, State, and Federal agencies. Most areas are developed at an urban scale or maintained as permanent open space. Essentially, the little remaining land available for development is heavily restricted. The majority of the Bay Trail would consist of existing class I trails and class II and III trails on existing roadways. In this context, the development of the Bay Trail may only have minor, localized influences on surrounding land uses.

The Bay Trail Plan, when implemented, could induce very localized economic growth by providing an additional source of customers for retail activities along the trail route. The Bay Trail may act as a recreational conduit of people to waterfront businesses. Recreational and tourism support services are likely to locate along the trail to capitalize on the passing trail users.

If the trail becomes a regional recreation attraction, it may act as a valuable amenity to homes within a quarter mile distance. If this phenomenon occurs, undeveloped residential lands within the band of enhancement could become relatively more attractive to develop than similar properties in the same neighborhood. However, the growth inducement potential would likely be confined to supporting the development of a number of in-fill sites.

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## **14. Unavoidable Significant Adverse Impacts**

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Implementation of the Bay Trail Plan will not result in any unavoidable significant adverse environmental impacts which cannot be mitigated to a level of insignificance by the implementing agencies at the time of individual project review and implementation.

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## **15. Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity**

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Adoption and implementation of the Bay Trail Plan would result in narrow strip of land approximately 400 miles long being committed to trail use. This land use commitment would limit the range of potentially beneficial uses of these lands, particularly where the trail is developed as a class I facility. Where development of the trail is proposed for existing rights-of-way, the trail would provide an expansion of uses.

The draft Bay Trail Plan contains policies and design criteria which are intended to minimize impacts and retain long-term beneficial uses. Future development review and environmental evaluation will contribute to preservation of biotic resources, and minimize land use conflict and traffic hazards.



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## 16. Alternatives

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### 16.1 No Project Alternative

Pursuant to California Environmental Quality Act, an environmental impact report must assess a "No Project" alternative to the proposed project. The "No Project" alternative would eliminate the comprehensive planning of a continuous shoreline trail system. The 189 miles of trail links that currently exist would not become part of a larger, regional network, but rather remain disconnected. Hiking and bicycling opportunities by the bayshore would remain spotty or altogether absent in some areas. Access to the Bay would remain chiefly available to those traveling by car to access points, while discouraging bicycle and walking access for those living in the most urbanized areas.

If the "No Project" alternative was implemented there would be no systematic, region-wide means of assuring recreational opportunities along the San Francisco Bay. Development permits would still be issued by the Bay Conservation and Development Commission and the respective local governments, with ad hoc provisions made for bayshore access and recreation. However, they would lack a larger framework for multiplying the recreational benefits and for coordinating the needs and interests of adjacent jurisdictions. Trail planning efforts of individual jurisdictions would continue, but without an integrating vision. Other beneficial impacts of the project would not be realized, including the recreational and aesthetic stimulus that the trail would provide in relation to economic development and waterfront projects, and the use of the trail as a connecting thread for the many bayshore parks and recreational facilities.

Certain environmental concerns would still be present with the "No Project" alternative. Limited landslide repairs would still be necessary along some portions of the trail alignment area, as in the Carquinez Strait area. Potential impacts related to sediment transport and erosion to local drainage areas would also persist. In many cases, this would result in the proliferation of undesignated trails, as people try to gain increased access to natural areas along the shoreline.

### 16.2 Use of Existing Roads Alternative

With this alternative, a route utilizing the present street system would be selected and striped. This alternative would be substantively the same as many of the class II bicycle lane segments of the proposed alignment; however, it would eliminate any class I segments of the trail where proposed and skirt the existing ones. It would also lack connections to existing parks and recreation facilities. Such a route would not meet the intent of SB100, the Bay Trail's authorizing legislation. In addition, it would provide a relatively unappealing trail experience, particularly for pedestrians who would be relegated to using sidewalks, where they exist. Were this the condition of the trail, hikers would be disinclined to use the trail.

Trail studies recommend that recreational paths be separated from streets where feasible and located in as natural a setting as possible.<sup>80</sup> The exclusive use of street paths would not offer the continuity or the quality of scenic and recreational experience that the Bay-oriented alignment would have.

Some potential environmental concerns would be allayed by this alternative. Since it would essentially involve no new trail construction (other than the widening of existing roads in some cases), there would be no anticipated vegetation or wildlife related impacts from trail construction. Wetlands and other sensitive environments would be avoided by the Bay Trail; however, proliferation of undesignated trails in environmentally-sensitive areas would be expected to continue, as people attempt to gain additional

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<sup>80</sup>These include the California Department of Parks and Recreation, Hiking and Equestrian Trails in California, May 1978, and Hart et. al., Bart/Trails: A Study of the Commuter and Recreational Trail Potential to the Bay Area Rapid Transit System, February 1974.

access to the shoreline. There would be minimal effects on surrounding land uses, as the trail would coincide with the current road network and would not attempt to link with shoreline parks. No significant flood or soils-related impacts would be generated or exacerbated by this alternative.

The route would require crossing and use of high-traffic-volume intersections. The use of roads in this alternative to the exclusion of class I paths would increase the safety hazard to bicyclists and pedestrians. Not only would they be more subject to conflicts with and accidents involving motor vehicles, but the potential combinations of streets utilized for the alignment could be disorienting to trail users in instances where the route was indirect. An exclusive street route would also lack the convenient trail connections that is the advantage of the preferred alignment for the Bay Trail.

An existing road route would not provide what the recreational trail user is seeking -- a distinct trail transportation system. A public open space corridor is inevitably preferable to street trails where this option is feasible.

### **16.3 Shoreline Only Alternative**

With this alternative the trail would be aligned closely to the San Francisco Bay shoreline throughout the Bay Area as a class I path system. It would incorporate existing shoreline trails, including the Hayward Shoreline Trail, Foster City pedway, the segments in San Francisco along the Marina Green and the Embarcadero, Shoreline at Mountain View paths, the Tiburon Path, among other trail sections. Several of these existing sections are class II segments, particularly in San Francisco and in portions of San Mateo County. The "shoreline only" alternative in the North Bay would parallel Route 37. Due to the severe existing traffic safety hazards, it would have to be separated from the road, either as a class I route coinciding with the highway alignment or placed atop an existing levee that roughly parallels the Route 37 in parts of Solano County.

Among the advantages of this alternative are its enhanced connection to the San Francisco and San Pablo Bays and the estuary's shoreline parks, together with its relative minimizing of traffic conflicts and the associated hazards to bicyclists and hikers.

The "shoreline only" option, while attractive in its offering maximum contact with the Bay, would likely have higher resulting erosion and flood-related impacts. Potential impacts on the wetlands of the region would be significant, due to the need for major bayfill to accommodate shoreline trails. This would be particularly evident in the North Bay, where the trail would be aligned near Route 37 north of San Pablo Bay Wildlife Refuge, and in the wetlands adjoining the Bay shores of San Jose, Fremont and Union City. Such an alternative would require bayfill for construction and generate a number of the negative impacts associated with human access to wetlands which were described in Chapter 8, "Vegetation and Wildlife." In addition, this alternative would violate Bay Trail policies 2, 9, 20, 21, 22, 23, 24 and would be contrary to both the letter and the spirit of SB100, as discussed in section 2.1.

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## 17. Report Preparation

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This program EIR was prepared by the Association of Bay Area Governments.

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# Appendix A

## Characteristic Plant Species In Habitats Adjacent to the Bay Trail

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### Bayland Plants

|                                                       |                              |
|-------------------------------------------------------|------------------------------|
| <i>Alisma triviale</i>                                | water plantain               |
| <i>Atriplex semibaccata</i>                           | Australian saltbush          |
| <i>Atriplex patula</i>                                | fathen, saltbush             |
| <i>Batis maritima</i>                                 | saltwort                     |
| <i>Beta vulgaris</i>                                  | beet or swiss chard          |
| <i>Cotula coronopifolia</i>                           | brass buttons                |
| <i>Cressa truxillensis</i>                            | alkali weed                  |
| <i>Cuscuta salina</i>                                 | salt marsh dodder            |
| <i>Distichlis spicata</i>                             | salt grass                   |
| <i>Frankenia grandifolia</i>                          | alkali heath                 |
| <i>Glaux maritima</i>                                 | sea-milkwort                 |
| <i>Grindelia</i> spp.                                 | gum plant                    |
| <i>Heliotropium curassavicum</i> var. <i>oculatum</i> | seaside heliotrope           |
| <i>Jaumea carnosa</i>                                 | jaumea                       |
| <i>Juncus</i> spp.                                    | rush                         |
| <i>Lilaeopsis occidentalis</i>                        | lilaeopsis                   |
| <i>Limonium californicum</i>                          | sea lavender, marsh rosemary |
| <i>Monanthochloe littoralis</i>                       | shoregrass                   |
| <i>Plantago hirtella</i> var. <i>galeottiana</i>      | plantain                     |
| <i>Pluchea purpurascens</i>                           | salt marsh fleabane          |
| <i>Rumex crispus</i>                                  | curly dock                   |
| <i>Ruppia maritima</i>                                | ditch-grass                  |
| <i>Salicornia</i> spp.                                | pickleweed                   |
| <i>Salsola</i> spp.                                   | thistle                      |
| <i>Scirpus</i> spp.                                   | bulrush, tule                |
| <i>Spartina foliosa</i>                               | cordgrass                    |
| <i>Spergularia marina</i>                             | sand spurrey                 |
| <i>Suaeda</i>                                         | sea-blite                    |
| <i>Triglochin</i> spp.                                | arrow-grass                  |
| <i>Typha</i> spp.                                     | cat-tail                     |

### Riparian Plants

|                                                    |                  |
|----------------------------------------------------|------------------|
| <i>Alnus rubra</i>                                 | red alder        |
| <i>Aralia californica</i>                          |                  |
| <i>Artemisia douglasiana</i>                       |                  |
| <i>Artemisia tridentata</i>                        | big sagebrush    |
| <i>Athyrium filix-femina</i> var. <i>sitchense</i> | lady fern        |
| <i>Avena tatua</i>                                 |                  |
| <i>Baccharis pilularis</i>                         | coyote brush     |
| <i>Bromus</i> spp.                                 |                  |
| <i>Ceanothus cuneatus</i>                          | wild lilac       |
| <i>Ceanothus spinosus</i>                          | wild lilac       |
| <i>Cornus</i> spp (not <i>C. nuttallii</i> )       | dogwood          |
| <i>Lonicera johnstonii</i>                         | honeysuckle      |
| <i>Populus trichocarpa</i>                         | black cottonwood |
| <i>Pteridium aquilinum</i> var. <i>pubescens</i>   | bracken fern     |
| <i>Quercus agrifolia</i>                           | coast live oak   |

## Riparian Plants, cont'd

|                                               |                       |
|-----------------------------------------------|-----------------------|
| <i>Rhus trilobata</i>                         | squawbrush            |
| <i>Ribes menziesii</i> var. <i>leptosymum</i> | canyon gooseberry     |
| <i>Rosa californica</i>                       | rose                  |
| <i>Rubus spectabilis</i>                      | salmon berry          |
| <i>Rubus ursinus</i>                          | California blackberry |
| <i>Sambucus mexicana</i>                      | elderberry            |
| <i>Salix</i> spp.                             | willow                |
| <i>Symphoricarpos mollis</i>                  | creeping snowberry    |
| <i>Toxicodendron diversilobum</i>             |                       |
| <i>Umbellularia californica</i>               | California bay        |

## Coastal Prairie

|                                           |                     |
|-------------------------------------------|---------------------|
| <i>Agrostis tenuis</i>                    | colonial bend grass |
| <i>Anthoxanthum odoratum</i>              |                     |
| <i>Armeria maritima californica</i>       | common thrift       |
| <i>Brodiaea pulchella</i>                 |                     |
| <i>Calamagrostis nutkaensis</i>           |                     |
| <i>Calochortus luteus</i>                 |                     |
| <i>Carax tumulicola</i>                   |                     |
| <i>Chrysopsis Bolanderi</i>               |                     |
| <i>Danthonia californica</i>              |                     |
| <i>Danthonia pilosa</i>                   |                     |
| <i>Deschampsia caespitosa holciformis</i> |                     |
| <i>Festuca arundinacea</i>                | fescue              |
| <i>Festuca idahoensis</i>                 |                     |
| <i>Festuca rubra</i>                      |                     |
| <i>Grindelia hirsutula</i>                | red fescue          |
| <i>Holcus lanatus</i>                     |                     |
| <i>Iris Douglasiana</i>                   | iris                |
| <i>Lupinus formosus</i>                   | lupine              |
| <i>L. varicolor</i>                       | lupine              |
| <i>Pteridium aquilinum pubescens</i>      | bracken fern        |
| <i>Ranunculus californicus</i>            |                     |
| <i>Sanicula arctopoides</i>               |                     |
| <i>Sisyrinchium bellum</i>                | blue-eyed grass     |



